THE

SURVEYOR, ENGINEER, AND ARCHITECT:

FOR THE YEAR

1840.

CONDUCTED BY ROBERT MUDIE.

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PREFACE.

HAVING brought the first volume of "THE SURVEYOR, ENGINEER, AND ARCHITECT" to a conclusion, we shall take the liberty of stating the motive which led to its commencement, and the principles upon which we have endeavoured to conduct it, a little more fully and explicitly than we could do in a prospectus issued before, or contemporaneously with, its commencement. Except in the case of a work which is already completed, or of one of which the party making the announcement has completely under his controul — and, in that case, the exception is only partial — these preliminary announcements are only promises; and, like other promises, they are liable to the contingencies of the future, how honestly soever they may be made, and with however fair prospects of perfect fulfilment.

This is especially the case with a periodical which professes to be novel in its plan, and labours to be more so in its execution. This would, in great part, hold true upon any subject; but, we believe, the subjects which we have chosen form the extreme case of this uncertainty. We were perfectly aware of this before we began; and indeed the fact of our being so was one of our chief inducements to begin. Of the journals then in existence, and professing to be devoted to similar subjects, there was not one, as was abundantly proved by internal evidence, in the confidence of any of the three professions. They were mere cesspools for the professional rejectamenta. They grappled with no principle; they analyzed no project or work; they suggested nothing new to be done, and nothing new or improved in the doing of it; and they did not point out the good or the evil that would result to the public from the doing of any thing, or the letting of it alone. They were, in fact, mere abridgments of the newspapers, or, if they had any thing from other sources, it was merely what the newspapers would have rejected as not of sufficient interest to the public. It consisted of scraps which the parties supplying chose to dole out for the furtherance of their private purposes, and of notices of small and insulated inventions, and proposals or projects, which neither could nor should be carried into execution. Even when the subject was, in itself, one of importance, what was published was only an interested scrap garbled for a party purpose, and carefully keeping out of view what would have enabled the public to come to a sound judgment upon the real merits of the whole case. In every instance, the interests of the public — the party most deeply concerned in all engineering projects — were entirely overlooked; and there was no trace of that grasp of mind which can lay hold of a whole subject, and bring it forward to advantage. Such was the state of the journals at the time when we projected our work; and such it remains even now.

But, though truth obliges us to say thus much, we blame not the parties — we attribute to them no unfair or improper motive; on the contrary, we suppose that they acted most honestly and conscientiously, according to the extent and nature of their knowledge, and their view of the case. The public and its interests had been put *hors de combat*, by the projectors, schemers, and jobbers, in railways and other joint-stock projects, and those parties, without any claims save those arising from impudence and effrontery, had quarried such an abundance, and continued successfully delving for it so long, that all men of small minds, connected with any thing that gave the slightest forecast shadow of a job, had come to the firm belief that the pockets of the public were a mine which any man might work for his own purposes, provided he could find tools hard and dirty enough for the work. This, we supposed, was the cause why the respectable part of the professions stood aloof from the journals; and this was another inducement to us to begin our labours.

From this examination of the existing journals, and from a conviction that many works had been unnecessarily done, and that the people had been made, under the sanction of Acts of Parliament surreptitiously obtained, to pay double or tenfold for what was imperfect or useless, we saw that there was an arena open, which might be honourably occupied, and upon or from which some good might be effected.

When we use the term "surreptitiously," with reference to certain Acts of Parliament, we mean not the slightest offence to the Honourable House. That House has, in its wisdom, made and established certain "standing orders," for regulating the introduction of all such private Bills as it may ripen into Acts. The parties must show that they have complied with those "orders" before they are allowed to bring in their bill; and, this showing once made, the bill comes in as matter of course, whatever may be its fate afterwards. This is the law of the House; and while it remains unabrogated the House must obey it; for, if they did not obey their own laws, they could not expect the nation at large to do it. But there arises another question: Is the law which regulates the bringing in of private bills exactly what it should be? The proceedings which have taken place under the joint-stock acts seem to answer in the negative: but this is a question upon which the House is at issue with itself; and we have no title to interfere.

Seeing that there was an arena open, that it might be honourably occupied, and that no other party made any effort to take possession of it, we resolved to occupy it ourselves, not without hopes that we should be able to do the public some service, and to get some credit for the doing of it. But, in doing this, it was not our intention, — and to that intention we have rigorously adhered, — to trench on the province of any one else. We could not be rivals to the previously-existing journals; and we do not think that they could or can be rivals to us. Those who read their pages are not the most likely parties to appreciate ours; and we do not think that those who relish ours would read theirs with much zest. We came forward to do that

which they had not done, and showed no intention of doing; and the world is wide enough for us all.

Having said thus much in regard to the propriety of our journal, we will now mention the leading objects which we sought, and are still seeking, to accomplish. We saw to what an extent the public had been gulled and abused by the schemers; we saw the leading men of the professions standing aloof, and nobody to bring them and the public to a better understanding with each other. Farther, we know, for we had heard it stated, and the fact lamented, again and again, that the respectable part of the profession had been suspected of making themselves parties in the jobbing, and thus had incurred part of the public obloquy, which the jobbers so justly deserved. We knew that this was not true; but, while the public believed it, the effect was exactly the same as though it had. The tendency of this was to sink the profession in the public estimation; and this at the very time when the interests of all parties required that it should stand as pure and as high as possible.

As one step toward the accomplishment of this, we communicated our intentions to many of the foremost men, both engineers and others, and they agreed to supply us with all information and documents which could be available to the purpose we had in view. We wished only for the information, the full and authentic information; and not for essays and disquisitions, bearing their signatures. If we had wished for this, we might have presented a splendid muster-roll of names. This, however, would have defeated our grand object, though it might have gained for us, at the hand of the unreflecting part of the public, a more rapid popularity than we could hope to obtain in our less ostentatious, but we think far more useful, way of dealing with the subject. We are not partial to the authority of names; because we have observed that many stop satisfied there, and never inquire into the truth — which is the grand matter; and we think the begging of papers, for the sake of the names of their writers, is about as low and contemptible mode of a beggary as can well be imagined. To beg thus of the leading Engineers and Architects would be mean; to buy of them would be impossible; and, though possible, it would be injurious to our main object. In fact, unless to authenticate a document, or establish the authenticity of something, we have no particular desire to see the name of a contributor in our pages: we leave that to those who are "supported by contributions," voluntary or otherwise.

We have never compromised, and we shall never compromise, the interest of any one who gives us information, by turning it against himself; and we shall never ground an argument upon information which is not authenticated, whether we may or may not cite the authority. But there is a higher and more important interest than that of any individual, which we are especially anxious not to compromise, or allow others to compromise, at least without making it known, and that is the interest of the public, which, however, is perfectly identical with that of the leading men of the professions.

We wish to see necessary public works done, in the greatest possible number, the best possible manner, and at the lowest cost which is compatible with excellence and durability; and, therefore, we wish to see the ablest men in the most full and constant employment. To take a few instances, even in London: What would the Houses of Parliament have been but for Charles Barry? What the Royal Exchange but for William Tite? What the New London Bridge but for the Rennies? What the new warehouses at the London Docks but for John Smeaton? And what many things else without the very men to whom they were entrusted? Look around you in the same city, and "the stone out of the wall, and the beam out of the timber shall answer."

Such being our plan for the commencement of our labours, and our plan for carrying them on, we shall now say a few, and but a few, words, as to the execution. On this subject, not many words are required to be said; for we can appeal to the volume to which these remarks are prefatory. With regard to the majority of our pictorial illustrations, we challenge comparison with any journal that ever was published, in regard both of the value of the subjects and the excellence of the style; and, if we were to be judged upon pecuniary grounds, we should say that, in many instances, the illustration is worth double the cost of the number. These subjects are mostly architectural; but all who are acquainted with the matter must be aware the engineering subjects are not adapted for pictorial illustration. Of the matter we shall not venture to say much. In commencing any work there are always difficulties to be met, both *esoteric* and *isoteric*, and time and patience are necessary in order to overcome them; but, in this, we believe we have succeeded. It is not necessary, neither would it be fair, to speak in detail of the contents when they themselves are before the reader. But we believe the reader who has read it will find in the volume much that is original, and not a little that is useful. He will farther observe that we have endeavoured to be strictly liberal in the best sense of the term, that is, we have never departed from public principle for the purpose of praising or censuring any one. As public journalists, no individual is our friend or our foe; our friend is the public, and our foe is every thing that is adverse to the public interest.

Acting upon this principle, we have received an ample and increasing support, and that in the quarters where it is most desirable. Therefore, we shall go on with increasing energy, and accumulated strength, and endeavour to make every succeeding volume more useful and worthy of our readers than its predecessor.

In name of, &c.,

ROBERT MUDIE.

London, Dec. 26, 1840.

THE SURVEYOR, ENGINEER, AND ARCHITECT;

OR

LONDON MONTHLY JOURNAL OF THE PHYSICAL AND PRACTICAL SCIENCES

IN ALL THEIR DEPARTMENTS.

BY A COMMITTEE OF PRACTICAL SURVEYORS, ENGINEERS, AND ARCHITECTS, OF MUCH EXPERIENCE AND IN ACTIVE EMPLOYMENT.

ROBERT MUDIE, LITERARY CONDUCTOR.

PRELIMINARY ADDRESS.

IN offering to the Professions, and to the Public, the First Number of "The Surveyor, Engineer, and Architect," we claim the usual privilege of making a few preliminary statements respecting our plan, and the mode and means by which we purpose to carry that plan into execution, in such a manner, we trust, as will be creditable to ourselves and advantageous to our readers, and to the public generally. This explanation at the outset is, indeed, more of the nature of a necessary and bounden duty than of a mere privilege. For we hold it to be a matter of justice and equity that they who solicit public patronage for any new work, be it of what class soever it may, are bound to show that such a work is wanted, and that it is calculated to supply, in an effective and useful manner, the want which renders it necessary.

Now, if the reader will candidly and carefully consider the three names of which our title is composed,—each in itself individually, and all the three in their mutual relations to each other,—he will not fail to discover that there is embodied in them the grand principle and foundation of all that now makes, or ever has made, one nation superior to another, in the comforts and the elegancies of life, and the encouragement and prosperity of all the subordinate arts.

To take one single example, from times long gone by, and when both the country and the people were as wild, and, for individual comfort and usefulness to each other, almost as destitute, as fancy can picture:—Britain, before the invasion by Julius Cæsar. It is true that the tin mines of Cornwall had been worked before this period; and Phœnician vessels frequented the Casserides, or islands of tin,—in all probability the isles of Scilly. It is also true that certain Belgic tribes had established themselves in the maritime parts of the south, where they grew corn and tended flocks, and carried on a little trade with their fellow tribes on the other side of the narrow seas. But it does not appear that the produce either of the western mines or the southern fields was ever carried to market in native vessels; or that this glimmering light of early civilization, upon the mere verge of the island, had the slightest effect upon the interior, or its inhabitants. Impenetrable forest and marsh then overspread all those parts of England where the fields are now the most productive, and the people most numerous and industrious; and so completely did these natural obstacles cut off one part from another, not many miles distant, that the inhabitants of opposite sides of the same forest or morass knew not of each other's existence; or, if they did meet occasionally, it was only for hostile purposes, and with the intention of destroying one another, without any imaginable cause for so doing, farther than that in a savage land man is ever found to be a savage being. During those early times, the inhabitants of Britain generally, and those of the inland parts exclusively, were without clothing, except when mantled in the undressed skins of wild beasts; and their dwellings were hovels of wattles, in the thickets and margins of the forests, in nowise superior to the wigwams of the rudest tribe of the American Indians. In some parts of England, this total separation of one district from another, because no Surveyor had examined the interjacent country, and no Engineer had opened up a pathway through it, came down to a period much more recent than many would be apt to suppose. Previous to the days of the Romans, the vast forest of Anderida extended along the whole Weald, and sandy districts, from the North to the South downs, and Westward along the clay and gravel soils south of the Kennet, as far as the borders of Wiltshire. In all probability, indeed, it extended much farther than this, and, joining the Mendip forest, stretched far westward on the south side of the Bristol Channel. The following extract from the journal of an eye-witness will give some idea of the nature of a journey southwards across the Weald. The writer is speaking of a journey through the Weald, or part of it, made by Prince George of Denmark, the husband of Queen Anne. It was from Windsor they started:—

"His Highness," says the narrator, who was one of the party, "gave directions to his coaches to be ready at six o'clock in the morning, on Monday, to go for Petworth. Accordingly, we set out at that time by torch-light, and did not get out of the coaches (save only when we were overturned or stuck fast in the mud), till we arrived at our journey's end. 'Twas hard service for the Prince to sit fourteen hours in the coach that day, without eating anything, and passing through the worst ways that I ever saw in my life. We were thrown but once indeed in going; but both our coach, which was the leading, and his Highness's body coach, would have suffered very often, if the nimble boors of Sussex had not frequently poised or supported it, with their shoulders, from Godalming almost to Petworth; and the nearer we approached the Duke's house, the more inaccessible it seemed to be. The last nine miles of the way cost us six hours time to conquer them, and, indeed, we had never done it, if our good master had not several times lent us a pair of horses out of his own coach, whereby we were able to trace out the way for him. They made us believe that the several grounds we crossed, and his Grace's park, would alleviate the fatigue, but, I protest, I could hardly perceive any difference between them and the common road."

Even when they got clear of the Weald, their disasters were not quite over. The Prince, the King of Spain, and their attendants, and coach, appear to have got on tolerably well; and no wonder, for they had eighteen or twenty relays of six horses each,—that is, some 120 horses to draw a coach with four persons the moderate distance from Petworth to Windsor, in the course of a whole day, with the reinforcement of "a neat dinner prepared for them by the Green Cloth," in the best inn at Guildford. It fared not so with the narrator, however, for he, Lord Delaware, and several others, were overturned, and had their coaches broken. Now if such was the case at the beginning of the eighteenth century, when a considerable portion of the Weald was cleared of wood, reclaimed, and under culture, what must have been the state of that district when the forest was at its full extent, and had entire conservation of its mires and marshes. And this is only one local instance; for a great part of the midland counties, which now form the most productive soil in the kingdom, were in the early times a continued succession of fen and forest, much of which was under water for more than half

the year; and thus they were not only comparatively useless in themselves, but spread pestilent diseases all around.

Look at the state of things now, even in these very spots, to say nothing of the general improvement, of which the improvement of them is only a small fraction. Along the main roads, in the Weald of Sussex, an ordinary stage coach rolls onward at the rate of some ten or twelve miles an hour, loaded with passengers, together with a considerable portion of luggage and merchandize; and, as for the midland counties, they are either one breadth of corn field, or rich meadows, covered with sheep and cattle. Formerly, man could inhabit only the highest and worst parts of the country; for the forest or the marsh held possession of all the better parts, and would not yield to any power of which the natives were then in possession; and, therefore, though they had been as diligent, and even as skilful, in the details of agriculture as they are now, they could not have raised food sufficient for one tithe, no, for one twentieth, of the population which England now supports in more abundance and comfort, upon the average, than any other land under the sun. As for anything like commerce, or general intercourse between the people of distant parts of the country, such a state of things put it entirely out of the question. No man, without arming himself with the whole strength of a district, and living by rapine and plunder as he moved along, could possibly have passed from one end of the country to the other, or even across one of the great and miry forests by which it was intersected; and a journey *per force*, of this description, could have been accomplished only by a party sufficient for overpowering the natives of every place at which he arrived; and, as savage men fight more fiercely for their wild abodes than men who are comparatively civilized, a journey over the country, for whatever purpose it might have been originally undertaken, would have been in the end a war of extermination.

How different is the state of things now, and with what increasing strides is it becoming more and more different every day. Formerly, men lived in the hut, the hamlet, or other comparatively small locality, in proportion to the extent to which they could command or compel the assistance of their fellows. But now, an inhabitant of England, if a man of any ordinary intelligence, may be said to live in and enjoy all England—and not all England merely, but the whole civilized world. And, with a very small loss of time and outlay of money, compared with what were requisite even after men had begun to consider themselves well advanced in improvement, he may actually visit all the essential parts of the country at home, and much of what is most interesting abroad. The power of steam has not only reduced the length of sea trips from weeks to days, but given them a certainty which never could have been attained by sailing vessels; and, where it has come into full operation as a means of transit upon land, the acceleration has been considerably greater than that on the waters. Steam travelling is also much more safe, because the command of the director over the power is complete; and, therefore, for an equal number of miles and travellers, the accidents by steam are probably not one tenth of those by horse power.

This is only one item; but it is the latest introduced, the greatest, and the one which is most exclusively the result of the ingenuity and labour of man, of all the grand series. That the wind or the current of the waters should propel a ship, or that a horse should draw a carriage or a canal boat, are cases in which the propelling power is obvious as a matter of first or surface observation. But that the steam of heated water should do the same, is by no means obvious to surface investigation,—it is the result of a lengthened train of scientific inductions, carried on and perfected by the observation and thought of many minds, and the labour of many hands.

All this is very delightful, and every one who has even a very slight feeling of the light which is abroad cannot but be joyful in that light; but still we must not forget the origin,—the first spark, which has in the end lit up such delightful and profitable splendour. We have said, and in so saying we have only quoted well-known and authenticated history, that, some two thousand years ago, the wild woods and morasses which held possession of all the better parts of Britain—of England especially, had taken so firm possession of their ground, and were so fully established in all the more obstinate parts of their character, that they not only withstood the attempts of the native population, but so dispirited them that they made not one attempt at the improvement of these, though naturally, as the event has shown, the most valuable parts of their country. How then did the improvement originate? The answer is told in few words: The Romans, who were a civilizing and an improving, as well as a conquering people, laid down lines of road, connecting all the important points with each other, and thus uniting all the parts of England of which they obtained possession or management—and they did so over the greater part of what was most valuable, into one country in the way of communication. Those Roman roads were planned with great skill, and executed in a most substantial manner,—so substantial indeed that some parts of them which have been used as common roads from the time of the Romans to the present day have stood in need of scarcely any repairs. The construction of those roads was Engineering, and Engineering of the most valuable kind; and of course it must have been founded on surveys, in the making of which no small degree of observation and ingenuity were necessary. The means which the Romans adopted in laying down a line of road from one point to another are not generally understood, though they must have been of superior kind, inasmuch as the Roman road, with scarcely any exception, takes the shortest line between its extreme points that can be laid down upon anything like firm or substantial ground. The elevations and depressions which those Roman roads contain—from the straight lines along which they are laid, are understood to render them not the best of all roads for modern purposes; though even here the modern plan of proceeding upon the levels as much as possible, though it may considerably increase the length of the line, has not been shown to be a superior line for pedestrians or for horses, and not in the most satisfactory manner even for carriages. But these Roman roads were admirably made, with a proper rise in the middle to throw off the rain, and consisting of a series of layers of stones, arranged like an arched pavement, with large ones in the bottom course, and the other courses gradually becoming smaller and smaller in the individual stones as they were nearer to the surface. This is the plan which has in part at least been adopted by the more talented of our modern road Engineers,—as by the late lamented Telford, in the Holyhead road, and in many of the lines which he laid down with such consummate skill in the Highlands of Scotland,—by which latter, an exceedingly wild and previously almost unknown part of the country was brought within the pale of civilization and the chance of improvement. Scotland, at least the highlands of that country, were nearly in the same state before the first construction of the military roads by General Wade that South Britain was before the Roman roads were constructed; and thus we can, in some measure, appreciate the eulogic couplet set up monumentally by the highland laird,—

"Had you but seen these roads before they were made,
You would hold up your hands and would bless General Wade."

Before General Wade constructed these roads, and they were but few, and chiefly for military purposes, the different glens and straths in the Scotch Highlands were in general as completely severed from each other as though the Atlantic had rolled between them; and, when there was not any more general object to quell their local feuds and give them a general purpose, they committed predatory inroads upon the property of each other as a matter of regular business, in which rapine was viewed more in the light of heroism than of crime. The lines of division between the highland clans were ridges of mountains, while those between the English tribes, that is, the tribes of South Britain, before the Romans opened pathways through the country, were close and miry forests. But the effect of the unbroken obstacles, and also of the breaking of them, was in both cases nearly the same, for union and the beginning of civilization followed the labours of the Engineer in the one case as well as in the other. And, when we consider the rapid progress which the inhabitants of South Britain had made in civilization during the five hundred years that they enjoyed the advantages of what had been taught them by the Romans, we can in some sort appreciate the advantages which result from even the first and simplest steps of Engineering. It is true, that when the decline of the empire, and the severity with which the barbarians of the north pressed upon its enfeebled condition, rendered it necessary for the Romans to withdraw their protection from the Britons, these latter were assailed by two successive barbaric invasions, the first by the Saxons and the second by the Danes. Such, however, was the root which Roman civilization, grounded upon those lines of union, had taken in the country, that, in spite of the cruelties which both these sets of invaders perpetrated, they did not turn into savages the people whom the Romans had civilized, but, on the contrary, received from them a certain, though probably a much lower, degree of civilization.

The following extracts from the Second Annual Report of the Commissioners of Public Works, Ireland, will show the advantages which have resulted from "Roads through uncultivated districts" of that country. "The very great benefit the country generally has derived from the formation of these roads has been repeatedly laid before both Houses of Parliament. Nothing, however, short of witnessing the effects produced can give an adequate impression of their value. In traversing a country covered with farms, and in a high state of cultivation, showing every sign of a good soil, and of amply remunerating produce, it becomes difficult to credit the fact that, ten or twelve years since, the whole was a barren waste—the asylum of a miserable and lawless peasanty, who were calculated to be a burden rather than a benefit to the nation. Many extensive districts are still without roads, where the country is capable of the greatest immediate improvement. Wherever a new road is constructed, flourishing farms at once spring up, *and the carts of the countrymen* (as has been forcibly expressed by one of our engineers), *press on the heels of the road-makers* as the work advances. Very large portions of Galway and Mayo were as a perfect desert; where no constituted authorities were obeyed, or even admitted, and from which no national benefit could be derived. Numerous judicious lines of road have here been commenced, by which the whole face of the country has undergone the most rapid improvement."

It is unnecessary to enter farther into particulars, or to allude to any of the other results of the grand combination of planning and executing, upon the great scale, with knowledge of all the circumstances, and for public and national objects. Such objects, and such means brought to the execution of them in the best, the most useful, the most elegant, the most durable, and at the same time the cheapest manner, form the joint province of Surveyors, Engineers, and Architects; but it is not always possible, neither is it necessary though it were possible, to draw the lines of demarcation between them, and assign to each his department. It is true that, in so far as manual operations are concerned, there must be a division of labour in those higher branches of art as well as in branches which are more humble: but the division of labour is one thing, and a good; while the division of knowledge and thought is another thing, and an evil; and there are no professions in which the want of due knowledge of all the circumstances, even of circumstances which appear to common observation to be too remote for being taken into the account, lead to errors, and evils, and losses, of such extent and magnitude. But all these matters are well known, and the harmony of the professions, as they work together, tells in the accommodation and comfort of every people that have had the benefit of the skill and the labour of those professions.

But, while we enjoy the oak, we must not forget the acorn; while we luxuriate on the apple, we must not forget the pip. England is now justly ranked at the head of the nations in all that Surveying, Engineering, and Architecture, and every useful and ornamental art, and every practical science, can do, to accommodate, to refine, and to elevate the human race. This is in great part owing to physical circumstances; but in part also to the energetic spirit of the people, which has been hammered upon the anvil of wars and contests, foreign and domestic, until it has acquired a high degree of spring and elasticity, and this has rebounded, and caused unprecedented activity and improvement in all the arts of peace; so that there is not a country, a city, a town, or even a village—nay, almost even a field, except in the very remotest parts of the country, which has not felt, in some degree or other, the renovating power of improvement, both in its appearance and in its usefulness.

National advantages have, indeed, done much; and the labour necessary for opening up roads, spanning rivers by bridges, constructing harbours, banking out the sea and draining the land, cutting canals, paving and lighting towns, embellishing their streets, and obtaining a higher class of buildings for private habitation or public assemblage, have all worked together with mutual stimulus for the enriching and ornamenting of the country. Nor must we forget the vast quantity of materials, and the unprecedented expense which all these great public improvements, whether local or national in their utility, have rendered necessary. But, in conjunction with a rapid progress of improvement, in things useful and ornamental, there walks a creative spirit which, all unknown to himself, new-enlightens the mind, and new-sinews the arm of every working man, who is not sunk and lost in the slough of ignorance and sensuality. And this creative spirit, while it has commanded the winds, the waters, and steam, to do the mere drudgery of the work, in concentrated volumes of power, to which no assemblage of human beings, and no collective effort of animals of any description, would be in any wise adequate,—and has contrived machinery to give proper effect to this mightily increased and concentrated power,—has also delivered the mind of the mechanic from the dull clog of unreflecting labour, and enabled it to display itself in that intellectual tone and strength wherewith it has been endowed by its all-bountiful Creator. And, the effect has spread over the land, illuminating and warming like the beams of the sun, till the dawn of its morning has reached the uttermost parts of the earth, and the results are delightful to contemplate. Mechanics' Institutions, and Libraries, and Museums and Galleries for the display of the products of ingenuity and skill, have sprung up in all parts of the country, with the happiest effect, and

an effect which is increasing every hour. Improved modes of education, and, improved books—as well for direct instruction as for rational occupation during the leisure hour, have been produced in numbers unprecedentedly great, and at prices unprecedentedly low; and they have all but finally expelled from the hands of the humbler classes those silly or exceptionable publications which, in times not long gone by, used to debase the mind and disgrace the dwelling of the working man. It is true that the gloomy ghost of foregone superstition, issuing from the damp vaults of ruined abbeys, and haunting wherever it saw or fancied a dim twilight of the mind, made a feeble effort to obscure the light, but, as physical darkness cannot abide the brightness of the physical sun, so no more can moral darkness abide the brightness of the light of science, even though that light is shed from an artificer who must labour for his daily bread. Accordingly, the unseemly thing has, with muttered curses against the bright spirit of the time, slunk back to the society of the moles and the bats, and is even now calling upon the ancient vaults to fall upon it, and hide it from that radiance which its feeble eyesight renders it incapable of enduring.

We have given these as examples of the advantages which the British Islands have received from civilization grounded upon the principles and practice of one or other of the professions whose names we have chosen as the specific title of our Journal; and we shall now proceed to state, in very few words, what we mean to do, and how, and by what means, we hope to be enabled to do it.

Though we ourselves shall not be idle, and are not without the means of obtaining extensive and varied information; yet, "in the multitude of counsellors there is wisdom," and "many hands make light work;" therefore, we court the communications of all intelligent gentlemen, professional or otherwise, who are connected with, or are interested in, any one subject which comes within the scope of our work; and the scope of that is so very ample that scarcely any thing which is of public benefit, either to a single locality, or to the country generally, can fail in being useful. What we especially desire is, to be supplied with the facts, as to what has been done, is doing, or is intended, or is wanted to be done; though we shall, at the same time, give a liberal range to disquisition. It will be for us to work into a general system, and point out the utility and the bearings, of all the individual matters which are sent to us; and it is this which we intend shall constitute one of the chief peculiarities and merits of our Journal. All the journals professing to contain similar matter, which we have examined, have struck us as resembling the untied bundle of rods—containing the quantity of material, but destitute of that principle of union which gives strength, and in which chiefly the real value of such a journal consists; or like the dry bones, without the sinews, the flesh, or the spirit; or the rude materials of a building, without the plan and the ingenuity by which they are put together. If we shall, as we sincerely hope will be the case, succeed in the accomplishment of this, we shall feel that we are performing a valuable service to the professions, and to our country, and a service of which it has not hitherto had the advantage. In everything we shall exercise the most unqualified fairness and liberality, and judge of every matter by its own intrinsic merits, and by no other standard. Having said thus much in illustration of the paramount importance of our subject, and of the manner and spirit in which we purpose to deal with it, we shall now mention, in brief, some of the leading subjects to which we mean to address our attention, and to which communications are very desirable, and if drawn up with that ability of which there is plenty in the country, cannot fail in being eminently useful, equally creditable to those by whom they are furnished, and valuable to the country at large.

1. Improvements of Land. We speak not of this with reference to the technicalities of agricultural or stock farming, but with regard to those operations of the Surveyor and the Engineer which may better adapt the land for either the one or the other of these, or for any other purpose to which land can be turned more profitably than it has hitherto been. This will include the reclaiming of waste lands, shelter, drainage, embankment, irrigation, and every other engineering means by which the soil of the country can be rendered more available, and more beneficial in every respect. In this, and in every other department, whether included in the present enumeration or not, it would be desirable that our correspondents should favour us with the geological, climatal, and seasonal circumstances of the locality to which their information relates, as these are all essential to a thorough understanding of subjects of this kind in the whole of their bearings.

2. Surveying in all its branches; including levelling, whether for the mere determination of magnitude and form, or for the discovery of the useful qualities of any locality, together with improved instruments, and improved modes of using them.

3. Inland Communication; whether by common roads, by railroads, or by canals, with the construction of bridges, and all other facilities of transit; the best materials to be used in the different structures, and the best modes of using them, for neatness, economy, and durability. In this department may be included every thing that relates to the paving of streets and thoroughfares, and the best materials and modes of working. The qualities of different kinds of stone and bricks, and the comparison of these with wooden blocks as pavement will naturally and appropriately come within this department.

4. Marine Intercourse, and its facilities and accommodations. This will include an account of tides, of river and sea currents, of the construction of harbours, quays, sea-walls, and embankments, and the best means and materials for their construction, together with what is to be done for their preservation; and also the construction of sailing and steam vessels, and any improvement which may be effected either in the one or in the other. Coast surveys, and careful observations of the tides, will form very important items in this department; and communications respecting them from competent authorities, will meet with peculiar attention.

5. Local Architecture. This department will relate to the style of buildings, both public and private, and the advantages which one possesses over another, in elegance of appearance, or in convenience of accommodation; and as the present is a time of more than ordinary display of and demand for talent in this way, we anticipate numerous contributions, from the many highly talented architects with which the United Kingdom abounds. We need scarcely add that, in this, as in all the other departments, we shall give the preference to merit alone.

6. Mechanical Engineering. This is a very important branch of the joint professions; because, without the instruments, the apparatus, and the machines, which ingenious men construct and improve, from time to time, the out-door labours of the others would be sadly paralyzed, and ineffective; therefore, we shall pay especial attention to every improvement in any one branch of this extensive department which is submitted to us, reserving to ourselves, at the same time, the privilege of dealing with it in strict accordance with its merits.

7. Inventions and Discoveries. If faithful accounts of these are sent to us, we shall duly notice them, reserving to ourselves the privilege of freely judging of their merits, which we shall invariably

do with candour, and without bias. We may say the same in the case of works sent to us for review, which shall always be described, and judgment passed upon them, in the exact ratio of their merits and usefulness.

Such are a few of the leading subjects to which the attention of our Journal will be invariably directed; and we trust that we shall, upon all occasions, so conduct ourselves as to merit the approbation and patronage of that public for which our labours have been undertaken, and to whose best interests they shall always be directed.

In order to furnish some idea of the points of the different subjects we have named, or of collateral subjects, upon which information appears to us to be much wanted, and calculated to do a great deal of good, we may mention two classes which are almost equally desirable; and which, as they vary much with localities, are required by every professional man who is called upon to exercise his talents on ground different from that upon which he has previously been employed. The first class consists of difficulties with which a professional man meets in consequence of physical circumstances, whether geological or otherwise; and the means by which he succeeds, or, at all events, endeavours to get the better of those difficulties. The value of the general diffusion of a knowledge of such difficulties encountered in situations of all descriptions, will readily be appreciated when it is considered that the geological structure, the atmospheric influence, the set and action of the tides, and an almost endless variety of other matters, differ so greatly in different parts of the British islands that one who has executed a public work in the very best style in one district may entirely fail if called upon to execute a similar work in another. Indeed the chance of failure, in the case of a man of successful experience in one kind of district, is apt to be greater in a different district than if he were without such experience. This is strictly true as a general principle; and yet it is a truth of which many lose sight. The maxim upon which the value of experience is grounded, is limited to identity of circumstances; and, if this is not attended to, the mere experience, the mere fact of having done a similar work before, has more tendency to mislead than to guide to what is right. Besides this, there is a strong tendency in every man to convert his experience into a habit, which habit he is apt to follow in a sort of mechanical way, without giving himself the trouble of the necessary experience. Of this we may mention one striking instance, adding that observation will show that this has been followed by many minor ones. The engineer who planned the railroad between Liverpool and Manchester, and who had not then any practical experience in the construction of a work of the kind, succeeded very well, both in executing and estimating the cuttings through the strata; because from their geological character these strata have no great tendency to imbibe water, expand with the frost, and slip. In the case of Chat Moss, he was a little more out, both in his estimate and in the execution, because the workings in the coal measures tended more to mislead than to guide him in the spongy matters which he had to encounter in the moss. When, however, his attention was directed to the London and Birmingham line, great part of which passes over strata very different from the coal measures, and even from Chat Moss, he was sadly thrown out of his estimates, and in many places the first workings were little else than a series of failures. The estimated expense, even when amended by the addition of 50 per cent., did not amount to above one-fourth of what has been actually expended already; and, yet, the line will be in many places a source of great expense for years to come. This is but one instance, though a very striking one; but there is scarcely a rail-road of any length upon which something similar has not occurred, and that too upon those which are of the most recent construction. Now if the difficulty had been publicly stated as soon as it occurred, the statement would have led to the investigation of it by scientific men generally, and the natural result would have been that it would have been much less serious in itself, and would not have occurred again in other instances. It is distinctly to be understood that no professional man, however eminent he may be, or however jealous of his reputation, ought to consider this as any confession of inferiority. Engineers, and gentlemen of the collateral professions, are not endowed with the gift of foreknowledge any more than other men; and therefore they would show their greatness, and their zeal for their own professional superiority, and the interest of their employers, far more by stating the embarrassments of a perfectly new case, which are common and necessary to all men, than by concealing them, and buying experience at far more cost, to themselves or to others, than it is really worth.

The very great importance of this class of difficulties, and the consequent obligation upon professional gentlemen to provide against them by every possible means, are so very great that we may venture to name, and only to name, one or two more in other departments. Harbours, and their requisite docks, claim a forward place in this class of difficulties; the more so that in some of them the difficulty is not to be got the better of by any means. Of harbours, Ramsgate is a conspicuous instance, and should serve as a warning not to attempt costly works of this kind in situations where the sea is invading the land; and yet it is reported that what has failed at Ramsgate is to be tried at Margate, where failure will be just as certain. Drifting shingle is also an untoward matter to deal with, of which the harbour at Dover forms a striking instance. Wet docks, and graving docks with shallow foundations on plastic clay or sand, are also very unwise attempts; and though there are many instances of failure in them, we are not aware of one of success. The characters of rivers, too, are very important elements in bridge building; and a professional man who has erected a permanent bridge on a slow flowing river, or one which has its mountain affluence regulated by lakes, is very apt to make a very insecure structure, if he attempts to construct a bridge with piers in the bed of a rapid river which has no regulators, even though the bases of those piers should be without the bed of the river during the dry season. Some remarkable instances of this have occurred on various rivers in Scotland, and in the mountainous parts of Wales, at least such of them as are subject to seasonal heavy falls of rain.

The second class of cautions to which we shall advert are those which respect the safety of the people employed. The Engineer ought to be well acquainted with the nature of his ground, his foundations, and his means of temporary support; because the failure of any one of these may be productive of the most disastrous consequences. This is especially necessary in driving tunnels through the chalk, where it begins to be overlaid by the tertiary strata. Where these meet, there has almost invariably been violent action, by which the chalk has been worked into pits, apparently by the action of the gravel, while rolling in water; and these pits are sometimes very treacherous, inasmuch as fresh portions of chalk may be filled in over the gravel, and conceal the danger. Very disastrous consequences resulted from this in driving the Kilsby tunnel, on the London and Birmingham line; the borings, which, from ignorance of the treacherous character of such grounds, were not made near enough to each other, all showed uninterrupted chalk to the very bottom of the intended

excavation. But one of the shafts, or the tunnel, or both, had been driven so near to the lower part of one of the concealed masses of loose gravel that its support gave way, and the whole contents of the chamber were instantly precipitated into the tunnel and shaft, destroying the workmen in the most summary manner, and occasioning no small pecuniary loss. This is but one instance out of many; but, as we shall have frequent occasion to revert to the subject, we shall not notice any others. In the mean time we must add, that if lives are sacrificed through ignorance on the part of those who ought to know the nature of all the materials, the parties thus ignorant are highly criminal.

THE REFORM CLUB-HOUSE.

[WITH A STEEL PLATE ENGRAVING OF THE ELEVATION.]

ALMOST an entirely new class of buildings has been added, within a comparatively short period, to the architecture of the metropolis, by the club-houses, which, with very few exceptions indeed, are the only ones which at all answer to the character of the *palazzi* of Italian cities. A sort of aristocratic homeliness pervades all the private streets of the west-end of the town; or, if there has occasionally been something like an attempt at embellishment, it has scarcely ever been either successful in itself, or appropriate in idea; for, instead of presenting us with stately mansions, our builders have only measured out by wholesale, so many hundred or thousand yards of houses, composing a single elevation, thereby rendering the disparity between the pompous pretension as to quantity, and the utter insignificance as to quality, all the more apparent and offensive. The terraces in the Regent's Park, Hyde Park Terrace, and the sides of Belgrave Square, unfortunately testify this but too strongly. In point of architecture, they are deplorable; vulgarly flaunting and tawdry, dressed up in coarse slatternly finery, and only so far scenic that, like the scenes of a theatre, they are fit to be seen only at a distance; and, like them, should never show themselves by daylight. Even some of the club-houses are not many degrees better: the Union is at once poor, patched up, and tawdry, entirely out of keeping, being plain even to meanness in some respects, finical in others. The United Service has so far more consistency, inasmuch as its architecture is very poor throughout. It may be called Italian, because it cannot be described as being of any other style; but then it is Italian in the last stage of a consumption: the style is thoroughly impoverished and enfeebled; and its spirit and gusto are there quite evaporated.

It has been, and we dare say will for some time to come be, the fashion to talk of styles, as if the adoption of a particular one necessarily insured all its best qualities, whereas it may lead only to its very worst. Infinitely more depends upon the artistical treatment of any style than on its mere elementary forms, since, even if transcribed with tolerable mechanical correctness, they reflect nothing of the true character and spirit of the style, when copied without any feeling for it. So, on the other hand, an inferior style may be improved and ennobled by a masterly developement of its better qualities. We are, therefore, inclined to regard the so frequently agitated question as to the abstract merits of Grecian and Italian architecture, as a somewhat idle and vexatious one; more especially when we find it dished up, again and again, in vague and muddy-headed verbiage. Putting all discussion of that common-place sort entirely aside, it will be greatly more to our present purpose to observe that, after being for many years almost entirely relinquished, the Italian style is beginning to come into favour again among us, which change in architectural taste may very fairly be attributed to the distinguished success with which that style has been employed by Mr. Barry, who has almost invariably given it the exclusive preference in those cases where the choice lay between that and Grecian. The additions at Trentham Hall, the Athenæum at Manchester, Lord Tankerville's villa at Walton, and other instances, attest this, but none, perhaps, more forcibly than the two charming pieces of street architecture, the adjacent Travellers' and Reform club-houses. Though somewhat eclipsed by the latter, the former of these two last-mentioned buildings is a most tasteful production, and well deserving of the distinction it has obtained, by being selected as the first subject of the work entitled "Studies and Examples of the modern English School of Architecture." Replete with study itself, and finished up with the utmost care in every part, it affords a lesson peculiarly instructive, inasmuch as it exhibits the very reverse of that insipid generalization of style, and disregard to minutiæ, which are the besetting sins of a great portion of our modern architecture, where nothing beyond mere columns and entablatures—which latter are, for the most part, left coldly bare—are considered of any account: whereas, without columns or pilasters at all, the garden front of the Travellers' is one of the most elegant pieces of design in the Metropolis; simple and chaste, yet without any of that repulsive meanness which is so frequently attempted to be passed off as simplicity; sober, yet studiedly decorated; with few features, yet those exceedingly effective, and producing much play and variety. Though not particularly striking in point of decoration, the interior also of this structure is in many respects highly deserving attention.

The Reform Club-House makes a far more imposing appearance, not only on account of its greater extent and loftiness, but also from the circumstance of its being detached from other buildings on three of its sides, which are made to constitute as many façades, two of which may be beheld together from the same point of view, whereby, being likewise uniform in design, a continuous rich architectural mass is produced. This circumstance produces a completeness and fulness of effect, which a mere façade upon the same scale cannot do; and yet such architectural keeping is continually disregarded, as if it were a matter of utter indifference whether attended to or not. Cornices are broken off almost at the very angles of a building; unsightly patches of ordinary brickwork, and mean chimneys, are allowed to show themselves at the returns of a stone front, besides many other offensive incongruities of a similar kind. Even Somerset Place, though a splendid pile upon the whole, is deficient in that totality which ought to characterize it, owing to the strange intermixture of showiness, almost finical, in some parts, and plainness, more than almost negligential, in others. Grosser instances of the same fault are so common that we may spare ourselves the trouble of singling out any, but, among the exceptions, there is hardly a more striking one than the Reform Club-House. For this highly advantageous circumstance in its favour, the building is no doubt, in great measure, indebted to the liberality and good taste of the architect's employers; but we also believe that for no employer would Barry compromise his reputation, and surrender up his better judgment and correct feeling in art, out of deference to the crude notions of the other. Had he been called upon to retrench his design, undoubtedly he would have done so; yet, we believe, that in complying with economy, he would have taken care that nothing whatever like parsimony should betray itself.

Very likely we shall be thought to dwell too long, and to lay too much stress, upon what would have borne to be dismissed with bare mention of it; yet, apt as they are to be overlooked, we are inclined to look upon circumstances of this kind as of no little importance, and to attribute to the disregard of them that unsatisfactory appearance of many structures which, by a little more attention to them, might have been rendered very much superior to what they now are. "Take care to roast the ends of your pig well," says the cookery book, "and the middle will roast itself;" so, too, in architecture, be careful to study diligently all those points, whether of minutiæ or not, which others are in the habit of overlooking, because you cannot very well, through sheer heedlessness, neglect what you are aware the merest novice in the art instantly directs his attention to. As it appears to us, it is in following such maxims that the secret of Mr. Barry's generally acknowledged superiority in great measure lies; not entirely, because there must likewise be the feeling for art which stimulates to that industry in which all the faculties are cheerfully devoted to the task; and industry of this nobler kind, be it observed, is very different from plodding diligence, which, satisfied with doing the 'passably well,' is unambitious of the 'better.'

If, in these prefatory comments, we have been somewhat tedious, it is because the annexed elevation of the Pall Mall front, leaves us very little to say in the way of description, as regards the exterior of the building, it being quite unnecessary to repeat in words what is there distinctly explained to the eye; while the south and west façades differ in so very few particulars from that represented in our plate that, those being pointed out, the other elevations cannot possibly be misunderstood. The sole points of difference then are, that the west side, being of somewhat less extent than the principal

mass in the other elevation, viz., 110 feet, has one window less in width; that is, has only eight windows on a floor instead of nine; while the south, or garden front, resembles the one shown, except that there is no entrance on that side, and the pediments to the windows are alternately angular and curved. Consequently, as far as the external design is concerned, all that is left for us to do is to express our opinion of it; and perhaps we cannot more clearly elucidate its character than by contrasting it with another well-known and highly-reputed piece of Italian architecture, namely, Inigo Jones' building at Whitehall. Though both are Italian in style, they belong to very different schools, and are designed upon very different principles. In the one, the introduction of two moderate-sized orders occasions what ought to be principal, namely, the columns and entablatures, to appear rather insignificant both in relation to the space over which they are scattered, and the windows likewise: while as decorative accessaries they are too much, as essential parts of the structure they are not enough. In proportion to the entire mass, the upper entablature looks puny and inefficient; well enough adapted to that particular division of the elevation, but not to the whole. Altogether, such an application of the orders,—to say nothing of defects of detail,—produces a dryness and littleness of manner precisely the reverse of the character of classical architecture. In this new club-house by Mr. Barry, on the contrary,—and the remark applies also to his former one,—instead of the composition being cut up into distinct divisions, finishing and then commencing again, it is made to form one consistent ensemble, crowned by a magnificent cornicione, proportioned not to a part, but to the whole; while sufficient decoration, in other respect, is derived from essential features and members, windows, string-courses, &c., which are allowed to display themselves with a boldness and effect hardly attainable where windows are introduced between straggling columns, the result generally being that the design looks rather confused and crowded up than rich. Here we perceive both richness and simplicity: the windows are very properly treated, as indispensable features; not as indifferent ones, or what it would be desirable, if possible, to get rid of, but as important in the design, equally necessary in themselves, and valuable as regards decoration. Neither do we here meet with that very offensive disparity of character in regard to them which is frequently allowed to take place, where no consistency of style is kept up between the windows on different floors, but the lower ones are positively mean and poor in comparison with the others; not only without dressings or architraves, but without that degree of finish they are susceptible of as apertures in a basement, whether that part of the elevation be rusticated or plain. Although the windows on the principal floor of the Reform Club-House possess superior richness to the others, it is that of degree rather than of kind; those of the lower floor being, although varied as to design, perfectly in keeping with them and all the rest; and even the dado beneath them, being decorated with panels between as well as below those apertures, whereby a continuous line of embellishment is kept up below, corresponding in a manner with that at the summit. Matters of this sort may be considered trifling: we can only say that it makes a very material difference whether they be attended to or not—in fact, almost the difference between taste and no taste; and if they require no very great effort or study, all the less inexcusable is it that they should be so frequently disregarded as of no account. In respect to the application of small columns to the windows of the principal floor, while we admit that it is a very great departure from the original purpose of such things, we hold it to be of the two a lesser solecism than that of employing columns equally uselessly as regards an entire building; inasmuch as in the one case they pretend to be nothing more than decorative members, while in the other, they would pass for being efficient parts of the structure. If, therefore, we can at all tolerate a deviation from strict propriety and the principle of utility, where we have some right to look for positive utility, it surely becomes hypercriticism to affect to be offended at it where it is evident that decoration alone is the motive. When small columns or pilasters are introduced as embellishments to windows where there are also larger columns, then, indeed, they are apt to become offensive; to look like miniature copies of the others, and to satiate the eye by mere repetitions of the same form on different scales. At all events, columns so applied cannot be considered more at variance with architectural propriety than window pediments, at which none but the most rigid purists take exception. We must yet be allowed one other observation, which is, that this and the adjoining club-house are both marked by one peculiarity, of which, till very lately, we had scarcely any examples: we allude to there being nothing whatever above the cornice, not even a blocking course, its upper mouldings forming the edge or eaves of the roof. It is partly owing to this that the cornice acquires such importance in the composition: a full climax is there produced, nor is it weakened by any thing extraneous being allowed to succeed it. Instead, therefore, of an awkward attempt at concealment, the roof is allowed to show itself undisguisedly, and to become a part of the design; whereas, it too often happens that the front of a building has the look of being a mere mask, behind which, there is a great deal of slovenliness betraying itself in the form of both ugly chimney-pots, garret windows, and steep roofs peeping out over balustrades, whose pretended purpose they flatly contradict. In this building, the roof will be covered by ornamental terra-cotta tiling, manufactured expressly for the purpose; and instead of being eyesores, the chimney shafts will serve rather to contribute to, than at all detract from, the general effect.

For cutting off and making a separate portion of the east end of the elevation towards Pall Mall, constituting a break between the two club-houses, there is very sufficient reason. Had any other architect been employed, he would most probably have given the façade the utmost extent of frontage, regardless of the injurious consequence to the adjoining building; but Mr. Barry has taken care to spare as much as possible his smaller façade (the Travellers'), by interposing that division; whereby the larger façade is also a gainer, since it now exhibits itself as a more distinct mass; besides which, the awkwardness of the large cornice of the Traveller's Club-House cutting against the other building is got rid of.

Though the windows of only three floors are visible, there are three others; viz., two beneath the ground-floor, a basement containing the culinary and other domestic offices of the establishment, and a mezzanine above it, in which are baths, dressing-rooms, servants' rooms, &c.; and a third for sleeping-rooms, above the mezzanine, lighted by windows on those sides of the roof which slope inwards towards the centre of the building. The mezzanine story is quite distinct from the apartments belonging to the club, being appropriated to chambers, or private lodgings (about twenty), to be rented by members. The public rooms on the other two floors are more numerous and spacious than those of any similar establishment. On the ground-floor, in addition to a commodious entrance vestibule, is a very spacious inner-hall, or saloon of communication, with which the staircase and principal apartments on both floors are immediately connected, so that this very striking portion of the interior will be continually offered to view. At present, we forbear entering into any description either of this or any other rooms, both because we have left ourselves little space for doing so, and because it would in itself be somewhat premature, the interior decorations being as yet only generally determined upon as to style, consequently changes with respect to detail may take place previously to their being executed. We would, besides, reserve a notice of such particulars till we can accompany it with a plan, without the aid of which, the most accurate description, unless exceedingly prolix indeed, would be found more or less obscure; at the best, tantalizing. All, therefore, we shall now add is, that on the ground-floor are the coffee-room, parliamentary library or news-room, house dining-room, and some others; the first-mentioned of which occupies the whole extent of the garden façade, (exclusively of the addition at the east end,) and its dimensions are 115 by 28 feet. The news-room, which is on the west side of the building, is about 50 by 28, and has four windows facing the side of the Conservative Club-House. On the principal floor is a drawing-room over the coffee-room, of the same dimensions; another library, or one for general literature, together with smaller drawing-rooms and card-rooms, besides others of a secondary character.

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ARCHITECTURAL COMPETITIONS.

Competition is a subject that has of late given rise to much comment, and to some discussion, yet has hitherto led to scarcely any farther result than the conclusion that the present system is one fraught with very great abuses, while numerous obstacles present themselves to the establishment of a better one. Difficulties, and very great ones, there undoubtedly are; but we think they have been designedly magnified and exaggerated by those who are op-

posed to competition, because they do not care to run the risk of being defeated in any shape, and being already established in their profession do not stand in need of it as the road to opportunity for employment, but rather regard it with dislike as opening such opportunity to fresh rivals. Accordingly, they only dwell upon and enhance the defects of the present system without suggesting any improvements in it; or rather affect to consider it so radically bad, so objectionable in principle, as to admit of no effectual remedy whatever. Nor can it be denied that on two recent occasions, both of great importance, and of no small public interest, the results have been so exceedingly unsatisfactory as to favour such conclusion, at least on the part of those who attribute the failures occasioned by mismanagement entirely to the system itself, and therefore regard the latter as erroneous and defective in the abstract.

For our part, we are neither disappointed nor discouraged by the signal failure, and consequent embarrassment in each of the instances alluded to. At what has happened we are not at all astonished, though we might have been agreeably surprised had the result in either case been very much for the better, seeing how very little pains were taken to secure a satisfactory one. Honesty of purpose there may have been: at all events we must suppose there existed a desire to let it be seen what talent would present itself, what ideas could be produced. Yet, as might safely have been predicted beforehand, such fairness of intention amounts in itself to scarcely any thing. What satisfaction is it to know that those who have power of choosing have done so to the very best of their ability, without showing favour or affection of any kind, if we also perceive that their judgment has been valueless, and grounded upon no assignable or assigned reasons. In matters of criticism and taste mere honesty alone is ridiculous, and may be deplorably mischievous.

In the competition for the Nelson Monument there was certainly a great show both of straightforwardness and liberality, for not only were the designs publicly exhibited, but, in compliance with public opinion, a second competition was allowed to take place; yet this apparent deference to the general voice, and seeming readiness on the part of the Committee to repair their first error, terminated in nothing than in confirming their previous choice in favour of Mr. Railton's Corinthian Column. After that, surely the rest of the candidates might fairly set down the second opportunity offered them as a mere delusion, very generous in appearance beforehand, but in reality a piece of dupery, whereby they were needlessly inveigled into farther loss of time, and additional disappointment. Either the Committee should have abided by their decision in the first instance, or, in allowing another chance to the competitors, they ought to have given them to understand that they considered something of a column the most appropriate form, and the one most likely to be adopted; in short, that, notwithstanding the dissatisfaction it had occasioned, they themselves had not materially changed their opinion. That not being done, the natural inference was that they were willing to rescind their former choice, and begin entirely *de novo*. Instead, however, of reconsidering the question more maturely, as they stood tacitly pledged to do by the course they adopted, they merely decided precisely as they had done before, getting rid of all discussion, by the convenient expedient of ballotting! It is, therefore, doing them no injustice to say that they could not justify their decision by any kind of arguments, and at the same time did not care, as individuals, to be known openly to vote for an obnoxious design. To other conclusion it is impossible to come without attributing to them a hardly credible degree of stupidity, leading them to imagine that the public would give them credit for being able to vindicate their choice by very sufficient reasons, although they chose to withhold them. With a certain plausible show of openness, there was also no small degree of secrecy, and a complete evasion of all responsibility. The whole affair now seems to be what, in vulgar phraseology, is termed "completely dished."

With this egregious example of mismanagement before their eyes, the Gresham Committee have not shown a whit more discretion in the competition for the Royal Exchange. Instead of affording an opportunity for the expression of public opinion, and thereby availing themselves of criticism when, if at all, it might be listened to advantageously, there was no exhibition of the designs until after the premiums had been awarded, and even then only for so very short a time as to be no better than a private view of drawings, to which a few persons were admitted, and even to those no leisure afforded for examining them at all properly. The only respect wherein the Committee appear to have taken warning from the competition of the Nelson Monument was in appointing three professional men as umpires, and leaving them to adjudge the premiums as they might think fit; but without requiring them to state their reasons explicitly for so doing. At least it was not done; for nothing could be more vague and unsatisfactory than the report furnished by the three umpires. There was not a syllable in it to justify the choice of the design on which they most unaccountably bestowed the first premium; and which was certainly one of the very poorest among those that could at all be considered eligible: it was not marked by the extravagances and absurdities that prevailed in many, but neither had it a positive merit of any kind to recommend it. In regard to practicability it might possibly have the advantage over many that were greatly superior to it in taste; yet, if it was on that account, and as more completely fulfilling the conditions of the instructions, considered the worthiest of all, it would have been no more than reasonable, for the satisfaction of all parties, that such should have been distinctly stated in the report, and its merits, whatever they might be, fully and plainly pointed out; which, it may be presumed, would have been no very difficult task to professional men. But if we are to estimate the service of professional advice by the assistance derived from it on this occasion, it certainly is of exceedingly little practical value. We should have imagined that when it was discovered that not one among the designs sent in could be safely recommended for execution, some being objectionable as too expensive, the obvious course would have been to have had a second competition, limited, however, to the authors of the eight designs which, including those to which the three premiums had been adjudged, had been pointed out by the umpires as the best. Nor could this have been complained of as unfair, except on the ground of the preference given to the designs so nominated being injudicious, if not unjust. Indeed we are of opinion that it would be a very material improvement in the system of competitions if, instead of being called upon in the first instance for finished drawings, the candidates were restricted to pencil sketches (of course drawn to a prescribed scale), merely setting forth their ideas, after which a certain number might be nominated, as entitled to enter into farther competition. Were that done, architects would be spared a great deal of time, labour, and expense, now bestowed upon what, though they may be finished as drawings, are seldom more than first studies and ideas, requiring reconsideration and maturing, for doing which no adequate time is now afforded, since nearly the whole must be devoted to the manipulation of the drawings themselves.

What will be the ulterior proceedings with respect to the Royal Exchange we neither know nor affect to guess at, they being so exceedingly eccentric that it would be rashness on our part to predict what course they will take. Indeed it seems now to be considered quite a hopeless case, and to be abandoned, with apathetical resignation, as one from which very little is now to be anticipated for excellence of any kind. As far as the public are concerned, it seems to be completely forgotten. The anti-competitionists may, therefore, consider it a signal triumph on their side. We have, however, just met with a short article bearing upon it, entitled the "Competitor's Tribunal," in the last number of the Polytechnic Journal; wherein it is proposed that the competitors themselves should be the judges, each being allowed to vote for that design, by some other party, which he would most favour after his own. The idea is certainly novel, but also eminently objectionable in principle, and by no means calculated to insure a judicious selection. On the contrary, it would confer equal power upon all, and the vote of a man whose own drawings ought to disqualify him from having any voice in the election would tell for as much as that of him who had shown the most ability. Besides which, it may very fairly be questioned whether it would be found practicable, since we suspect, the authors of many of the designs for the Royal Exchange would rather forego such privilege, than throw off their present *incog.*, as must in such case be done, because else each of the unknown might vote for himself. We farther object to there being something hypocritical in a candidate voting against himself, unless it were perfectly of his own free will, out of a generous and disinterested preference in favour of a rival. We are moreover strongly opposed to any system of decision by voting or ballotting at all. The idea of so testing the merits of works of art is nothing short of preposterous. It would be just as sensible to decide the matter by raffling, or drawing lots; in some respects

more convenient, because, then, let the result prove as unfortunate as it might, no odium could attach to any one: nobody would be to blame but chance. What kind of responsibility, we should be glad to know, could possibly attach to any of the persons so voting? And yet it is, after all, responsibility on the part of the judges which is, in all such cases, required. Unless the *why and wherefore* accompanying it be satisfactorily explained, whatever it may be in itself, any opinion is comparatively valueless, inasmuch as it carries with it no weight: it may be unexceptionable, but then it must be received entirely upon trust, there being nothing to vouch for its soundness.

Competition, it will be said, is beset with difficulties on all sides; still we cannot help thinking that formidable as some of them now appear, they might be overcome, provided only that the getting rid of abuses, and the introduction of a better system, were set about in downright earnest: — where there is a will there is a way. HOW? That *is* the question, undoubtedly; and we reply to it by submitting the following outlines of a scheme, leaving others to suggest such additional measures as they may conceive would render it more effective.

I. Adequate Time should be afforded for making designs.

II. The Programme or Instructions furnished to the competitors should be properly drawn up by a professional man, and be as full and as distinct as the circumstances of the case will allow.

III. As initiatory to all farther proceedings, there should be a Public Exhibition of the Designs as soon as received, in order to sound general opinion as to their merit, and take into consideration whatever remarks and criticisms so elicited may be found worthy of attention.

IV. In the meanwhile, Two sets of Umpires ought to be appointed, one consisting of Professional, the other of Non-Professional gentlemen,—say, three of the one and three of the other, each of which parties should be required to draw up a separate Report, wherein should be distinctly specified what they might consider the particular merits of the designs recommended by them, and, also, the objections if any, that might be alleged against them. Were this done, an effectual guarantee would be provided not only against unfairness, but against indolence, carelessness, or precipitancy of judgment. Each party would be a counterpoise to and check upon the other, and would, of course, be exceedingly cautious with regard to expressing opinions which they must substantiate, both in the first instance, and, perhaps, be called upon to do so more fully afterwards. The Professional men would be aware that they must have regard to taste as well as to mere technical merits; while the Amateurs, on the other hand, would be equally aware that they could not safely recommend, on the score of taste alone, a design or designs that might in other respects be very defective.

V. The Two Reports having been sent in to the Committee, sealed up, would be afterwards carefully compared; after which the other designs being dismissed, those recommended in the Reports (which might or might not happen to be entirely different ones), should be scrupulously investigated, the Umpires being called upon to give farther evidence before the Committee, to furnish whatever explanation might be required of them, and reply to whatever questions might be put to them. These proceedings should not be hurriedly despatched, but the meetings of the Committee should be adjourned as repeatedly as there might be occasion for doing so.

VI. At these examinations of the nominated Designs, those which had least in their favour might be thrown out successively, until the number was reduced to two, for the ultimate choice: which choice being made, the reasons upon which it was grounded should be published, together with the names of the parties sanctioning it, and of the dissentients likewise, should there happen to be any.

VII. The Author of the selected Design should not be bound to execute it in strict conformity with his drawings, but be at liberty to suggest whatever improvements in it might have since occurred to him upon more mature consideration of it. There would be nothing in the least degree unfair in allowing him this privilege, because he would have earned it *de facto* by his superiority over his fellow competitors, in the first instance; while to refuse it to him would be nothing short of so far thwarting what is after all the main and sole aim of the whole business, namely, to obtain as perfect a design as possible, as carefully studied, in every respect, as the architect can render it. Mere common sense would dictate such a course, for an author might with just as much propriety be interdicted from making any subsequent alterations in a manuscript accepted for publication by a bookseller, as an architect from revising and improving an accepted design, previously to the building itself being actually commenced. In the latter case the restriction might be even more fatal than in the other, because subsequent editions of it may afford opportunity for introducing improvements into a literary work; but there are no second editions of works published in stone and mortar. With respect to these latter, it may be said, "as the tree falls, so it must lie;" on which account, it is advisable that the utmost study and circumspection should be employed beforehand.

STONE FOR THE NEW HOUSES OF PARLIAMENT.

CORRESPONDENCE BETWEEN THE CHIEF COMMISSIONER OF WOODS, &c., M. J. STAUNTON, ESQ., AND OTHERS, RESPECTING THE SELECTION OF STONE FOR THE NEW HOUSES OF PARLIAMENT.

No. 1.—Copy of a Letter from Charles Barry, Esq., to the Right Hon. Viscount Duncannon.

Foley Place, 20th April, 1839.

My Lord,—I have seen Specimens of the Stone from the Ballysimon Quarries, and have, both personally and by letter, obtained from Mr. Staunton full information as to its price, power of working, supply, &c. My opinion is, that it is ineligible for the proposed new Houses of Parliament, on account of its colour and the cost of the labour of working it, which would render its adoption more expensive than that of several other stones of this country of equal durability and of more favourable colour, and would occasion a considerable increase upon the estimated cost of the proposed building.

I have the honour to be, &c. CHARLES BARRY.

No. 2.—Copy of a Letter from M. John Staunton, Esq., to the Right Hon. Viscount Duncannon.

My Lord,—Having had the honour of communicating to your Lordship my anxious wish to see employed the Limerick Marble in the building of the new Houses of Parliament, I beg leave to make an offer and a proposition for the supply of it, being convinced that it cannot be surpassed as to its durability, and that no stone or marble can be obtained at so cheap a rate; independently of which, your Lordship will be rendering a most important service to that part of Ireland, where the poor, and particularly those employed in the quarries, are at this moment suffering the greatest privation from their having been all lately discharged from the public works.

Offer.—I beg leave to offer to Government gratis any quantity of Limerick Marble from my Ballysimon Quarries, situate near Limerick in Ireland, for the purpose of being used in the construction of the new Houses of Parliament, the Government to be at all the expense of extracting and carrying it away.

If Government declines the above offer, I beg to make the following proposition for supplying it:—

Proposition for supplying Limerick Marble.

In block, rough, as taken from the quarries, delivered on board ship at Limerick....	at	1*s.* 11*d.* per ton.
Ditto, delivered at Westminster	at	16*s.* 0*d.* per ton.
Ditto, scabbled and squared, delivered on board ship at Limerick	at	per ton
Ditto, delivered at Westminster	at	per ton.
Ditto, one face worked as plain work, delivered on board ship at Limerick.....	at	per ton.
Ditto, delivered at Westminster	at	per ton.
Slabs of two inches thick, worked as plain work, delivered on board ship at Limerick	at	per foot.
Ditto, delivered at Westminster	at	per foot.

Slabs, of two inches thick, worked plain and polished, delivered on board ship at Limerick.....	at	per foot.
Ditto, delivered at Westminster	at	per foot.
Moulded architraves, chimney-pieces, &c., worked as plain work, delivered on board ship at Limerick	at	per foot.
Ditto, delivered at Westminster	at	per foot.
Moulded architraves, chimney-pieces, &c., worked and polished, delivered on board ship at Limerick.....	at	per foot.
Ditto, delivered at Westminster	at	per foot.

Gothic Ornaments.—No fixed price can be put upon this article, as the variety of ornaments that will be required, the height, and situation, are so various, that every ornament will require a different price to be affixed to it.

The above, my Lord, is the proposition that I wish to make to Government, subject to any alteration that the architect may deem necessary; my present wish being only to show your Lordship the form of proposition I intend making.

I have the honour to be, &c. M. JOHN STAUNTON.

24, Somerset-street, Portman-square,
24th April, 1839.

No. 3.—Copy of a Letter from Charles Barry, Esq., to the Right Hon. Viscount Duncannon.

Foley Place, 22nd April, 1839.

My Lord,—I enclose a copy of a letter I have received from Mr. Smith, the mason who accompanied the Commission upon the late inquiry respecting Building Stone, by which your Lordship will be informed of his opinion of the cost of the labour of working the stone which has been submitted to the Government by Mr. Staunton for adoption in the new Houses of Parliament, as compared with that of Portland stone, upon which the calculations in the estimates which have been delivered of the cost of that edifice have been formed.

I have the honour to be, &c. CHARLES BARRY.

29, Clipstone Street, 20th April, 1839.

Sir,—Agreeably to your request, I have this day examined the black marble at Old Barge House Wharf, near Blackfriars' Bridge (Surrey side). I consider it to be a material precisely similar to Kilkenny marble, which was extensively used for chimney-pieces and other internal works about twenty or twenty-five years since. After the peace when Italian marble was abundantly imported, Kilkenny, being far more expensive to work, gradually became almost an useless commodity in the market. By referring to my books, I find that in the year 1817 the price of labour alone for sawing Portland stone, was 5*d.* per foot; at the same time, 1*s.* 5*d.* was paid for sawing Kilkenny marble. If it were contemplated to erect a large building with Kilkenny Marble, I have no hesitation whatever in asserting that, at a very moderate calculation, the labour would cost at least three times as much as it would if Portland stone were used.

I remain, &c. C. H. SMITH.

Charles Barry, Esq.

No. 4.—Copy of a Letter from Charles Barry, Esq., to the Right Hon. Viscount Duncannon.

Foley Place, 26th April, 1839.

My Lord,—I have perused the Letter from Mr. Staunton to your Lordship, of the 24th instant, as well as the printed letters and testimonial transmitted therewith, the whole of which are enclosed. I have already expressed to Mr. Staunton my opinion that the stone from his Ballysimon quarries near Limerick is ineligible for the new Houses of Parliament, and I see no reason whatever to change that opinion from the perusal of the correspondence above alluded to. My objections are,—to its colour, which is dark and sombre; to its hardness, which would make the cost of labour upon it at least three times as much as is allowed under that head in the estimates which have been delivered, and sanctioned by Parliament; and to the delay which would be the consequence of its adoption in the completion of the intended edifice.

It is possible there may be other objections that might be discovered upon an inspection of the quarry, and an inquiry into the rate, means, and cost of supply; but those which I have stated are, in my mind, so insuperable as to render any farther inquiry unnecessary. Even in the foundations of the new Houses of Parliament, where colour is of no importance, and where Mr. Staunton seems to think his stone could be used with the greatest economy, I beg to observe that he is much mistaken; for the cost of its transport alone, according to his own statement, (independent of the cost of quarrying, landing, rough scapelling, labour and mortar in fixing, &c.) would be at least one-third more than the cost of the brick work which is now employed in that portion of the work.

I have the honour to be, &c. CHARLES BARRY.

No. 5.—Copy of a Letter from William Smith, Esq., to Charles Barry, Esq.

Scarborough, 4th May, 1839.

Dear Sir,—Your little specimen of stone arrived at Scarborough on Tuesday, while I was several miles off on a geological survey of the soils of a large estate. After our laborious investigation of the different kinds of freestone I little thought there could be a question on the propriety of using any beds of the Mountain Limestone Rock as a building stone, especially for Gothic architecture. In all my extensive observations I never saw this kind of stone used in any building of the least architectural pretensions, but one, in the front of a respectable house, but there of picked light-blue grey beds, and in one front of Trinity College, Dublin, where, from the pyrites which the stone contains, the walls are in a bad mouldering state.

That the Limerick specimen is from mountain limestone no skilful geologist will doubt; or that it is from the same range of the beds as the Kilkenny marble; the Tenby, Templeton, and Abergavenny in South Wales; the black marble (in Mr. Mawe's shop window) from Derbyshire; and that from Dent Dale, Yorkshire, which the family of Websters of Kendal, during two generations, have manufactured for chimney-pieces, tablets, and tombstones.

Along this, its very extensive geological range, there may be other quarries, and doubtless many other places, where the same kind of stone might be found and applied to the same uses, but I should think from no place of better quality than from Abergavenny, used many years since in fitting up the ornamental rooms at Bristol.

The whitest of any beds of stone from the mountain or metalliferous limestone rock, is that from Hopton, of which you have a specimen and the requisite particulars.

Having stated the geological relationship of the Limerick stone to stone enough of the same kind in England and Wales, I must acknowledge that I cannot discover its eligibility; even as a marble the Abergavenny is freer from spots and white streaks, but blackness and polish are out of the question for the purpose required. And, passing over its requisite workmanship and its durability, we have in the specimen, on the side opposite the polished one, a proof of the colour it will assume by time and weathering. Such a truly dirty brown as that side exhibits will be no more admired in age than its sombreness in youth.

Used in a building it will grey a little in dry weather and blacken in wet, or with fog or the least moistness, which effect may be seen strongly contrasted by holding together squared specimens of the Limerick and Bolsover stone, (both being rubbed specimens,) and breathing strongly upon them while in contact.

By this simple experiment their comparative degree of dampness instantly appears, and in its drying you will see the changeable effects which moisture will produce on a front of Limerick stone. Giving this black limestone the specious name of marble, because it admits of a polish, is a sad misguiding perversion of terms, for the Bolsover stone in its crystalline mineral structure much more truly resembles marble, and the polish (as a false glossing-over the surface of things) should not appear in its comparison with other stone.

I am therefore of opinion, from its dampness and other reasons, that it is far from being a fit and proper stone to be used in the superstructure of the intended new Houses of Parliament, and the effect of its adoption in a Gothic building would be a kind of sepulchral gloom, not to be enlivened with those pleasing contrasts, and ever-changing effects of light and shade, which every one of taste looks for and admires in such a style of architecture.

Hoping you will excuse the unavoidable delay in answering your letter, I am, &c., WILLIAM SMITH.

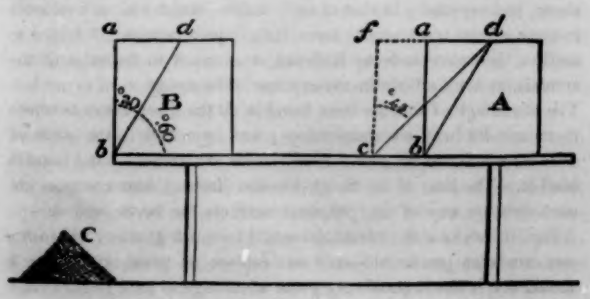
Charles Barry, Esq.

THE PRESSURE OF EARTH AGAINST SUSTAINING WALLS.

BY COLONEL JACKSON.

THERE is, on the subject of sustaining walls, a common error which I would beg to point out, as it is the cause, in some cases, of a very large amount of useless expenditure.

From the observation of natural sections of loose soil, it is confidently asserted that the natural *talus* or slope of such is about 45°, and so it really is; but when, from this fact, it is concluded that a perpendicular sustaining wall has to bear the pressure of a prism of earth whose angle at the bottom is 45°, a great error is committed. The real slope at which even the loosest soil will maintain itself is 60° and not 45°. The following experiment will show the truth of this:—



Let A be a box filled with sand and standing on a table. Now if the side *a b* of this box be carefully removed, the sand will fall down and form a slope *c d*, of about 45°. Now let the box be again filled, but placed at the edge of the table as at B, on removing the side *a b*, the sand will fall down on the ground at C, and it will be seen that the angle *a b d* is an angle of 30°, and its complement of course 60°.

The angle *d c b* of A is occasioned by the prism of sand *d a b*, after its fall, forming a triangle of equal base and altitude, leaning against and superadded to the natural slope *d b*, which would be the profile if the fallen sand were removed, as in the case B.

Hence it follows that as the earth can, and really does, maintain itself at an angle of 60°, a sustaining wall has only to support the pressure of a prism *d b a*, and not that of a prism *d c f*, as is generally believed. The difference is enormous, and by so much is the thickness of sustaining walls augmented beyond what is necessary. If they are long and high, the useless expenditure in time, labour, and materials, is very great.

If further proof of the truth of what I have here advanced be wanted, I would merely instance piles of round and smooth bodies, as balls, bullets, or fine shot, which all stand at an angle of 60°.

PROJECTED TUNNEL THROUGH THE ALPS.

THERE are few countries to both of which a short and comparatively cheap means of intercourse and transit of commodities, would be more mutually advantageous than to those which lie on the north and the south of the grand ridge of the Alps. This ridge extends, as an almost uninterrupted barrier, for several hundreds of miles; and though there are a few passes through which an adventurous traveller may find his way, and one or two where an army may get through with vast labour and at great expense, there is none which is at all adapted for civil intercourse; and, therefore, northern Italy and the south of Germany are, in reality, as wide apart as if half the circumference of the globe lay between them; though, from the great contrasts of their climates, an exchange of commodities would be greatly useful and stimulating to the industry of both. Now though, taking the Alps directly across, from north to south, no thoroughfare could be obtained, yet, as the mountains run in ridges in the direction of from the south of west to the north of east, there are some spots where the northern and southern waters, and valleys of no very great elevation along which their waters flow, approach within a moderate distance of each other. This is particularly the case with the waters flowing into the Lake of Como, on the Italian side, and the upper or most southerly branch of the Rhine, in the canton of the Grisons in Switzerland. The valley of the Maira, which flows southward to the Lake of Como, lies wholly in the Austrian territory, and extends close to the base of the ridge of the Splugen, into which the main spine of the Alps is here narrowed. The valley of the Upper Rhine is immediately on the opposite side; and, though the Splugen is high, it has perhaps less breadth than the chine of the Alps at any other place. Therefore, if it is practicable to pierce the Alps by a Tunnel at any one place, this is exactly the place at which to do it,—the more so, that a railroad has already been established between Como on the Lake and the City of Milan, thus bringing a communication with the whole of Lombardy close to the base of the Splugen on the south. A privilege of fifty years was, in 1837, granted by the Austrian Government to M. Vanino Volta the engineer of Como, and M. Bruschetti of Milan; and so favourably do these gentlemen think of the extension of this line

through Switzerland to the Rhine, or a near communication with it, that they have completed a negotiation for a privilege of one hundred years, to carry the line through the Austrian territory, which extends to the summit of the Splugen; and they are now in negotiation with the cantons of the Grisons and St. Gall, through which the northern part of the line will pass to Wallenstadt, on the lake of the same name, in the last-mentioned canton. Thence, to the Lake of Zurich, the distance is not great, neither is it very great from that lake to the Rhine, upon which this grand connecting line would terminate below the fall at Schaffhausen; and thus an uninterrupted communication would be obtained, through the centre of the country, all the way from the Adriatic to the North Sea, to the great advantage of all the countries through which it passed.

M. Vanino Volta is an engineer of talent and experience; and he has examined the Splugen with great care, and has no doubt of the practicability of the Tunnel. He estimates the time for the execution at thirty years, and stipulates for the power of establishing companies, making assignments, or adopting any other means by which this grand scheme may be carried into execution. As to the practicability of the Tunnel through the Splugen, there cannot be the least doubt—the only question being that of the expense. Nor ought there to be any difficulty even there; for the numbers, not of individuals only, but of states, which would be benefitted by this line of communication, is very great; and, if the expense were duly apportioned among them, it would hardly be felt. Half the expense of one of the great battles which were fought during the late war, for objects of small importance, as compared with this, would complete the works, and leave for those who promoted them a far more noble monument than ever was obtained by even the most illustrious of warriors. Buonaparte's road over the Simplon will be remembered, when Marengo, and Austerlitz, and Wagram, are forgotten; and, as this project has a more commendable object, it will insure brighter and more lasting fame to those who carry it into execution.

BRANCH RAIL-ROADS.

When these great works began first to be planned and executed, the notions of the parties promoting them, and also of their opponents, were chiefly confined to the species of traffic which had previously been carried on by coaches on the roads, and track-boats on the canals,—the first for passengers, and the second for heavy goods; and, the expectation of getting this on the one side, and the fear of losing it on the other, were the causes of much contention, litigation, and expense.

But they overlooked a truth which has been established by experience in many instances—namely, that, as a new office demands and soon attains a new instrument for its performance, so a new instrument fails not to suggest and to call into existence a new office, for the performance of which it is better suited than for that of any of those old instruments which it was at the first intended to supplant. This has been conspicuously the case with Rail-roads, especially where the lines have been judiciously laid down. They have, it is true, taken a good deal of the stage-coach trade in the way of passengers, especially through-and-through passengers for long distances; though, as they can neither carry the line to the intermediate towns, nor bring these towns to the line, there is a limit to them in this respect. Of the canal and wagon trade, they have taken, and will continue to take, comparatively little, unless in cases where a long distance wagon or its load can be carried for a long stretch upon the line. The reason of this is obvious; goods which are carried by canal or wagon are not, in general, such as are required in a hurry, such as are liable to injury by being long on the passage, or such as incur any expense increasing with the length of time they are upon it. They are often such, however, as would be more likely to be injured by transference from carriage to carriage, than by being a day or two longer in the same one.

There is, however, one description of freight which is liable to injury, and certain to incur expense by being longer on the road than the very shortest time in which it can be conveyed by wagon or canal. This is live-stock of all kinds; but more especially stock which is fatted and made in prime condition, in remote parts of the country, for the market of the metropolis, and the other great towns. It is for the benefit of all parties that animals for the markets should be brought into marketable condition in those remote places, because it can be best and most cheaply done there. The fattening of cattle and sheep is, in many, if not in most, of the rustic agricultural districts, an important, if not a necessary adjunct of tillage-farming; nay, so necessary is it that not only will much be lost on a tillage farm, but the production of grain will be greatly diminished unless the proper quantity of stock is not only kept but fatted upon it. The same holds true of pigs, poultry, and the whole of what may be called farm-yard stock. They all cost something no doubt; but, in the end, they save more than they cost. No detailed argument is necessary to establish this, for we have the general evidence that where stock is deficient the land is always out of heart, and the crops inferior. Not only this but the flesh of animals which are fatted in the free and open air of the country is more wholesome, more nourishing, and more racy in its flavour, than that which is forced by artificial means in a confined atmosphere; and thus the consumer gains every way as well as the producer.

But, admitting that the animal is got into the very best condition in some remote part of the country, the question of the getting it to market at the smallest expense, and in the best condition, still remains to be solved; and in this solution both parties have very great interest. The desiderata obviously are, that it should be the shortest time on the way, and undergo the least fatigue possible. If long on the way, it will increase the cost, and if fatigued, it will be injured in quality,—most likely to such extent as that no after treatment will be able to make it what it was before the journey began. Animals which are driven, not only fall off in condition, but, if they are dressed for the consumer while in that state, their flesh is unwholesome. If they are sold in this state, the public are very unfairly dealt by; and, if they are kept till they are forced into condition, a new expense is incurred, and still the meat is not so good as it was at the first.

Carriage by coach, by wagon, or by canal, is out of the question, at least as a general practice; and, therefore, this seems one of the purposes for which Railways are specially adopted. In the case of sheep, and especially in that of early lambs—which are very valuable in their season, and cannot have their injury repaired if driven to market, the conveyance by Railroad saves much in the value of the animals, and not a little in the expense of bringing them to market. The advantage of this has been found in all the sheep districts where there are Railway communications; and especially in the southern districts which are the grand countries for early lamb for the London market. The line of the South-western Railway does not pass immediately by any of the principal markets for lambs and sheep; though if it did so, the advantage would be much greater. If such a measure were practicable—and one can see no great reason why it should not, it would be of very great advantage to have Branch Rail-

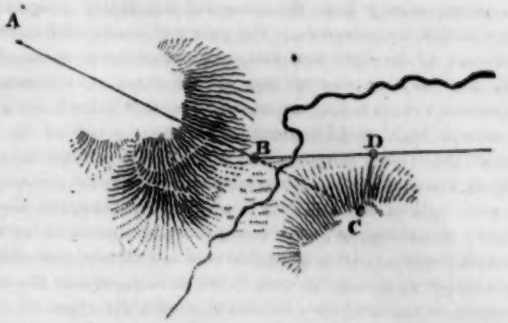
ways, with less powerful engines, and every way less costly both in original cost and in management, — Railways which should be suited to the local traffic, and carried to the stations of all the more important country markets. Thus, for instance, in the case of the South-western Railway, it would be desirable to have one branch from near the Farnborough station, carried through Farnham and Petersfield, and as far under the Sussex downs as might be necessary. Another might, with even more advantage, be carried to Salisbury, as one of the greatest markets, especially for sheep, in the south-west; and if the arrangements were properly made, a train upon the main line could be provided for running the loads from the branch trains, only upon the days when it was required, which would not be above once in the fortnight, or at the most, once in the week; and with proper regulations, this would require no great additional expense, while the benefit to the public would be very great.

The fact is, that this system of transit, much as has been hitherto done in the greater lines of it, is still only in its infancy; and one can hardly conceive any limit to the improvements that may yet be made. It has, in the case of branches especially, a very great advantage over the canal system. The latter cannot be put into operation, even on the smallest scale, unless there is a supply of water at the summit; but the Rail-road is tied to nothing farther than the obtaining of a sound bearing for the rails, and such gradients as that the engines can work. For this, and the other reasons that have been named, as well as for many others that will readily suggest themselves to the reflective reader, the subject of Branch Rail-roads is one which is well worthy of consideration.

REMARKS ON MEASURING THE ANGLE SUBTENDED BETWEEN TWO BASE LINES.

It should be an invariable rule with Surveyors, in every possible instance, to commence and terminate their base lines on high or rising ground, for the purpose of being better able to obtain a good *bearing* on the back line when taking the angle of the forward base. The case under notice is where a long but narrow line of country has to be surveyed, such as that required for a railway, a canal, or a road, in which there is no opportunity, at least without great trouble or loss of time, of checking the relative position of the base lines by triangulation, and from this it will be evident that the absolute relative positions of the two lines, and consequently the value of the survey will depend upon the extreme accuracy with which the subtended angle is measured. No doubt can be entertained but that great advantages are gained in Surveying, if the one extremity of the base line can be seen from the other, as in such case little harm would arise from a slight deviation from a straight line in the intermediate part; but if a very slight intermediate deviation, indeed, from a straight line should take place when the one extremity cannot be seen from the other, the angle would probably have to be taken from the deflected part; if so, it will immediately be seen how very erroneous the relative position of the two lines would be placed although the angle be measured with ever such care.

In the example of which we are about to speak, it will be seen that the error arising from being able to obtain only a very short bearing on the back line can, in most cases, be avoided, and the angle taken with as much accuracy as if the extremity of that line was visible from the angular point, and with this additional advantage, that a check (not very severe it must be admitted) is obtained by triangulation.



In the accompanying diagram, the base line A B is required to terminate at the point B, to allow the line B D to be laid out advantageously. It must be understood that the station at B is on low ground, with the crest of a hill rising immediately behind it, by which the sight from B towards A is limited to a very short distance, and consequently the back angle, if taken from the point B, will have but little *bearing* on the line B A, in which case, although the operator be ever so expert in the use of angular instruments, or careful in recording his observation, no very great dependence could be placed on the angle A B D, which it was the object to determine. The method proposed for the purpose of accurately obtaining the subtended angle A B D, is to extend the line (trace it only, not measure it) from B onwards to a point C on high ground, or until the point A or other well determined point, on the back line become visible. At C set up a theodolite, and by slightly removing the same to the right or left the correct extension of the line from A through some well determined points, to C, can be easily determined. This being done, the station at B can be precisely fixed with the instrument while at C, a plummet,—suspended from the axis of the instrument, will also as precisely fix the point C—which being done, an angle may be taken to any object on the new line, as to D. The instrument being then removed from C (a flag being fixed up in its place) to the before determined angular spot B, the angle D B C will be taken, which is the supplement of the required angle A B D. When measuring the line B D, if the distance B D be noted, and the angle B C D taken, a check on the accuracy of the work will be obtained, for the three angles will, of course, amount to 180°, (the sphericity of the globe in such operations will be inappreciable) and having the length of one side, of course the other sides, and angles, could be obtained by calculation.

By this means the angle between two base lines can be measured with nearly as much precision when the back angular point is invisible, as on the contrary. From the importance of accuracy of direction in such plans as just referred to, it is presumed that any suggestion for accomplishing so desirable an object will be acceptable to the profession, for whose consideration these remarks are submitted, by a

SURVEYOR.

NOTE BY THE CONDUCTOR.—It is desirable that the inexperienced Surveyor should be well acquainted with the fact, that the data which he takes in the field are to be estimated, not by the best but the least perfect, upon the very same principle as the weakest part of a machine is the proper measure of the strength of that machine taken altogether. Now it must be understood, that in ordinary surveying, where great expense cannot be afforded, the least accurate part of the data consists of the line or lines that are measured upon the ground, and this without any reference to the sphe-

rical excess, arising from the measured line being a small arc of the earth's circumference. The principal causes of inaccuracy in this part of the data are; first, the variableness of the chain itself, not only in consequence of difference of temperature, but because a chain is apt, nay certain, to stretch if much used, and therefore it ought to be frequently corrected by rods of dry deal kept for the express purpose; and secondly, the extreme difficulty of laying a chain in a perfectly straight line, not only with the horizon, but with the level of the surface to which it is applied, and also the difficulty of making one chain's length a continuation of the same line with another. An angular instrument, such as a good theodolite in the hands of a skilful user, is less liable to error in the determining of an angle, whether horizontal or otherwise, than the chain is in determining the length of a line. Therefore, when one part is made out by a lineal measurement in the common way, and another part by angular measurement, the two parts of the data have different degrees of accuracy, and thus the errors of the one do not compensate those of the other. If, however, in determining the subtended angle of a line, such as that alluded to by our intelligent correspondent, a lineal check were obtained, the angular part of the business might be made more correct. The best way of doing this is by means of equal portions of the two lines forming the angle, and the distance between their extremities measured exactly in the same manner as they are themselves. The three sides of an isosceles triangle are thus obtained, and the half angle of subtension, and from that the whole of it are found by one simple analogy—namely, as either of the equal sides is to half the distance of their extremities, so is radius to cosine of half the angle of subtension.

GREAT CARE NECESSARY IN BUILDING ARCHES.

The few remarks I have at present to make on this subject may not be considered of much importance by some readers, but notwithstanding the small portion of information which I may convey in this paper, I think to effect some good if I only succeed in drawing attention to the matter.

In the carrying into execution works of great magnitude—as for instance many lines of railway at present in the course of execution, the numerous bridges required to be erected to keep up local communication have produced a habit of careless execution, and insufficiency of materials quite reprehensible. The "make-shift" principle has been too long and too often practised by contractors, for being at all consistent with the continued good name of our Engineers, the interest of their employers, or the safety of the public.

In the erecting of common road or occupation bridges, the centerings are frequently of the most inefficient and insecure kind; and in fixing the ribs, so little attention is paid to stability in the standards, sills, caps, &c., that I have been frequently surprised the weight of the half-turned arch resting thereon, has not brought the whole to the ground. [A case of this kind occured on the Great Western Railway, at Drayton, about three years since, where a labourer, who had taken shelter from a storm under the arch, was killed,] indeed, I am quite satisfied that very many accidents of the kind would occur was it not the almost general custom to turn such arches in cement, which, by its great adhesiveness when good, scarcely seems to require any centering farther than as a mould to lay the bricks on.

Mr. Brunel, in his experiments at the Thames Tunnel, a year or two back, succeeded in building an arch to the extent of fifteen feet from the abutments, without support of any kind beyond the adhesiveness of the cement, and which, by the use of fir laths and hoop iron bedded in between the courses of bricks, he extended to the surprising length of upwards of sixty feet, being equal to an arch over 120 feet span; but, to accomplish anything like this, cement of a superior quality to that employed in railway bridges must be used. This brings me to the main subject of my communication—"That great care is necessary in Building Arches, and that, from the want of it, arches are often destroyed;" to which opinion I am led by observing, in the elliptical shaped arches that it is now common to build, frequent fractures in the haunches, or a few feet above the springing, which I conceive to arise from the inefficiency of the centering, and want of care in the execution. It is usual, in turning such arches as those just named, to carry on the whole thickness of the arch at once from both abutments, until keyed in at the crown, by which method, when within a short distance of the key, the entire weight of the arch is thrown on the centering, which, by sagging in the least degree, must fracture the portions of the arch already built; for it is well known that cement beams will not deflect in the slightest degree before fracture takes place, as may be ascertained by reference to the breaking of the experimental brick and cement beam at Nine Elms, about a year and a half since, as also to Mr. Brunel's experiments on the same subject at the Tunnel. What I would recommend to be done where there is the slightest weakness in the centering, and indeed I am inclined to think would be preferable in every case, is to carry up the whole thickness of the arch as high only as the haunches, and then to carry over the first ring and key in the same before the other rings are carried farther; then but little weight would be thrown on the centre, as, on the first ring being completed, it would be well able to support the remainder during the executing; but even then I would be careful in having the second ring keyed in before bringing up the third, after which no possible harm could arise from carrying over the remainder in any way most convenient. Another matter worthy of attention, connected with this subject, is, always to carry up the arch equally on both sides, otherwise there will be a chance of the centering being displaced or crippled from the unequal pressure, especially if the arch be turned in mortar. So much for the building of the arch; now for the care required in removal of the centering, which the want of is often, I am confident, the cause of crippling many arches. It is a common, but erroneous opinion, that the centering of cement arches may be removed immediately after the completion of the same without chance of accident, quite as well, I have heard practical men observe, as a year after. Now a reference to any experiments on the adhesive powers of cement will prove the contrary, and how very much the adhesiveness is increased by age. But my letter is getting too long, and I must defer farther remarks on the subject to a future opportunity.

A Sub-Engineer.

THE OSCILLATING STEAM ENGINE.

This description of Steam Engine was invented many years since, by M. Schwartz, Professor of Technology, at Stockholm, who constructed a twenty-five horse power boat-engine on this principle, with the most complete success. His engine had its two cylinders and condensers, swinging side by side of each other upon solid trunnions at the lower ends of the cylinders and condensers. There was, therefore, no difficulty in effecting condensation. The steam was admitted through stuffing boxes placed close to the trunnions. The connection of the air pump placed between the cylinder and condensers was also effected in a similar manner. About five years ago this gentleman came to England, and Mr. Gill sub-

mitted his plans to most of the engineers in the metropolis, but no one would take it up. Recently, however, Messrs. Penn, the Engineers, of Greenwich, have fitted many boats with oscillating engines, but have not, by all accounts, adopted all the improvements which M. Schwartz, proposed. Mr. Gill states the advantage of these boat engines to consist in their compactness and admirable disposition of weight, which also answers all the purposes of ballasting. Their principle advantage, however, appears to be *in the cylinder playing to the circular movement of the cranks without requiring the help of parallel motions.*

MR. TELFORD'S SCALE OF PROPORTIONS FOR BRIDGES ON THE HIGHLAND ROADS,

THESE proportions are in feet and tenths; and it is to be understood that the material used was stone, the foundations hard, often rock, and the danger to be guarded against the impetuosity of the floods of mountain streams.

Span of arch.	Rise of arch from the springing.	Depth of arch stones.	Height of abutment from the bed to the springing.	Thickness of the abutment walls on an average.	Length of parapets from the face of the abutments with wings under.	Height of parapets above the crown of the arch.	Thickness of spandrills and wings on an average.	Thickness of inverted arches, where necessary.
4	1·6	1	2·6	1·6	9	1·2	1·6	0·9
6	2	1	2·6	2	10	2·2	1·6	1
8	3	1·2	2·6	2	12	3·2	2	1
10	3·6	1·3	3	2·6	12	3·2	2	1
12	4	1·4	3	3	14	3·2	2·6	1
18	6	1·6	3	4·6	18	3·2	2·9	1·4
24	8	1·9	4	5	24	4·2	2·0	1·4
30	12	2·0	4	5·6	30	4·2	3·6	1·6
50	15	2·6	6	6	36	4·8	3·	1·6

SUSPENSION RAILWAY.

WE have, says our French informant, been present at several experiments made by M. Nepveu, before engineers, architects, and builders; and all, like ourselves, who take interest in the progress of the arts have been astonished at the ingenious simplicity of the means employed, and at the moderate expense of this suspension railway, which promises to be productive of much economy in transport.

We shall not in this place, without the assistance of graphic illustration, attempt to give a description of the railway of M. Nepveu: every one has seen it, and may see it still, in the Rue Lafayette, at the corner of the Rue des Magasins. Suffice it to say, that it may be constructed by any skilful workman, that it is adapted to all situations, that by means of it, a marsh, a pond, or an arm of a river, may be traversed with facility, and that the expense varies from 25 to 30 francs per metre (or from 100,000 to 125,000 francs per league), according to the difficulties presented by the nature of the soil, and the greater or less weight of the loads to be transported.

To complete his railway, and to facilitate the raising of the loads, M. Nepveu has invented a new system of cog-wheels and pulleys, which, in combination with the screw-lewis, likewise invented by him, is advantageously applied to the moving and fixing of the stone. With this machine, one man can raise 1000 kilogrammes to the height of one metre in a minute.

We have heard, from all quarters, predictions of the most splendid results that are to follow from M. Nepveu's invention. Now, we do not think—and our opinion appears to be shared by the inventor himself—that this new railway will, as certain enthusiasts would persuade us, be immediately applied to the transport of passengers, and supersede the fixed railroads which are now being established in France with so much expense and difficulty. The investigation of this point is left to the commissioners nominated by the Minister of public works, to whose inspection M. Nepveu has submitted his plan; those of the Academy of Sciences, (MM. Ch. Dupin, Cariolis, et Poncelet,) and those of the Society for the Encouragement of National Industry.

But even now we may be certain that this new railway will be successfully employed for the carriage of goods, for the working of mines and quarries, and for the construction of important buildings, especially bridges, in which it will afford an advantageous substitute for water-carriage.

LOCK GATES OF THE THAMES AND MEDWAY CANAL AT ROCHESTER.

BY MR. COLLIER.

THESE gates, MR. COLLIER observes, were put down in the year 1822, they were made of cast iron posts and ribs, with wood planking three inches in thickness; when taken up this year, (September, 1839,) it was found that that part of the iron which had been almost constantly under water was so much softened that it could be easily scraped away, or even cut to the depth of an eighth of an inch, with a knife, and that part of the iron which was under water, and also exposed to friction, seemed to wear away rapidly. The lower part of the wood-work of the gates was much worm-eaten; the very bottom of the wood was quite a honey-comb; at two feet up, less eaten; and so gradually diminishing up to about five feet, when no traces of worm were found.

From experience I can state, that wood may be effectually preserved from worm by tarring it, and then covering it with sheet iron; the iron should be fitted on to the wood as exactly as it can be conveniently, but it is found that, in addition to the difficulty of entering the iron, *the worm will always avoid wood which is in intimate contact with iron;* nails thickly driven into wood, will preserve it from worm in salt water. After the wood is covered it would be well to lay on a coating (over the iron) of tar, pitch, and tallow, mixed, and put on in a boiling state; tar is a very good thing for destroying worms.

Believing as I do that wood may be effectually preserved from worm, it appears to me that there are many advantages in wood over iron lock gates, and particularly in a tide canal, the gates of which are constantly at work, and at all times of the tide, whereas ship docks open their gates only once every high water, and let into a sort of inner basin the whole of the ships and craft presenting themselves; thus making but one lock for the whole. Wooden gates do not receive so much injury from a blow, are more easily worked in consequence of their buoyancy, and relieve the lock walls &c., from a great and unnecessary weight. In case of misfitting, they will yield a little, whereas iron gates misfitting, and having a great pressure against them, would be very liable to break. It might perhaps be better to have a facing of brass on the lower rib, and the pointing sill should be faced with brass. If the gates have to work in fresh water, iron both for the rib and sill would answer equally well, or perhaps better.

The meeting post of all lock gates is furnished with truns on a small thick roller, which are made to shift, so that when the gate in the course of its work droops a little at the meeting post, the roller may be forced lower down, thereby, in effect, lifting the gate to its

proper square. In the working of gates, this matter is very material to be attended to, as, when the meeting posts cease to be perpendicular, and to take their proper bearing against each other, the gates are easily broken.—*Proceedings of the Scientific Society.*

THE COAL FIELDS OF BELGIUM.

[COMMUNICATION FROM MR. ARTHUR DEAN, READ AT THE MEETING OF THE SCIENTIFIC SOCIETY OF LONDON, JAN. 9, 1840.]

In Belgium, as in France, the right to all minerals, not already granted or conceded to individuals or companies, is vested in the crown under certain modifications.

If a proprietor of land imagines minerals to exist under his estate, he is at liberty to make such researches as he may think necessary to determine that point, when, if successful, he immediately applies to the government for a "concession" or grant of the minerals within a certain district, having given four months notice in the parish or commune in which it is situated, of his intention so to do, in order that all other claimants, if there be any, may prefer their claims, if they desire it.

Should the proprietor of an estate under which minerals exist refuse to work them himself, when applied to by the government or any individual, then any other person may compel him to make the necessary researches by paying double the amount of the damage they may cause in the prosecution of such works. The fine reserved by government is 5 per cent. upon the net profits; and, to prevent fraud in this respect, the country is divided into sections, each of which is under the supervision of an engineer belonging to the Bureau des Mines, whose duty it is to examine the books of the company, and to see that the works are carried on in a proper and miner-like style.

1. Belgium Miners, and method of conducting the Mines.—The miners vary very much in different districts in point of skill; those of Liège and Mons being in general able and expert workmen, whilst those of Namur are far behind; indeed, so much so that it is not twenty years since they were totally ignorant of the use of the mariner's compass; and, on the first introduction of one into the district, they imagined the magnetic needle was an animal, which they designated as "le petit bête;" and by that name the instrument is known at the present day. The mines in the neighbourhood of Liège and Mons are, generally speaking, well conducted, although considerable improvements might be made in the modes now employed in sinking the pits, in driving, and in sustaining the ground.

The staff in most of the large mines consists of an engineer, master miner, and several under masters, whose duties are entirely confined to the underground management; clerks, and enginemen.

The men are paid at per yard forward or in depth, as it may be, for sinking and driving, and by the cube yard, or some standard measure, for getting the coal. In some mines women are employed in pulling or shoving the small wagons employed to transport the coal on the trams, which are laid down throughout the gateheads or galleries which traverse the mines. The general scale of wages is, for a good miner, 1¼ to 2 francs per day; and candles or lamps are supplied by the proprietors when the work is done by the day, but in matters of bargain, all charges are included in the price given, except hauling the stuff that is broken; this is done by the proprietors. Women and boys get from 12 to 14 sous per day, and some trifling allowances extra.

One of the greatest charges on the mines is for the wood necessary to support the ground whilst the coal is being worked out. In many instances, owing to the "roof" of the mine being bad, it is necessary to leave the timber in, as it would be impossible to take it out but at the risk of the lives of the workmen; in other places, where the roof and sill are both good, the "props" or "setts" may be knocked out and the roof allowed to fall and fill up the space from which the coal has been extracted. Again, the great demand for wood has enhanced the price so much, that, in several mines near Liège, inferior sorts have been employed, such as alder, willow, and Canadian poplar; and the consequence of which has been, that serious accidents have occurred from the rapid decay to which these species are subject in moist or damp places, such as the workings of a mine. The principal supply of timber for these purposes is obtained from the forests of Luxembourg, to which access may be obtained from the Meuse, the Samoy, and other tributary streams; the price of the timber is as great or greater than in England.

2. Geological Features and Boundaries of the Belgian Coal Fields.—There are four coal fields in Belgium, viz., those of Liège and Limbourg, Namur, and Hainault. These may be again classed, the two former under the name of the Basin of the Meuse, and the two latter as the Basin of the Sambre. These basins approach each other at their extremities within a mile and a half, the intermediate space being occupied by the outcrop of the great carboniferous limestone, which underlays both basins, and by its appearance at the surface serves accurately to mark their extent, except in some few places, where, from its being but little inclined, it is overlaid by more recent deposits belonging to the oolitic and cretaceous series of strata, which also serve to cover the coal measure within the basins in some places to the depth of two hundred or three hundred feet; but this is not altogether so disadvantageous as might at first sight appear, for the coal measures being highly inclined and formed of schist, grit, and other porous strata, would admit an immense quantity of rain water into the mines, which is now effectually kept out by the covering of the before-mentioned strata.

3. Basin of the Meuse.—This basin is about 13½ leagues in length, and may be defined by drawing a line from the village of Thon, in Namur, to Sippenaken, in Limbourg, and in its greatest breadth three leagues, which may be found by a line at right angles to the last, going due north and south from the village of Beaurieux to the village of D'Olne, both in the province of Liège. The principal natural productions found within this basin are coal, iron, calamine, alum, lead ore, and marble. For the calamine there was formerly more demand than at present, as the principal supply is now derived from the rich mines of that mineral in the neutral ground between Belgium and Prussia. The alum shale exists in abundance, but, since the peace of 1816, the works have nearly all stopped, as the French market, for which it was principally in demand, is now supplied from other sources. The lead ore has only been partially worked, but in no instance to an extent sufficient to determine the value of the veins.

The marble is in great demand, more particularly the black variety, and it is exported to a considerable extent.

The carbonate of iron is found in beds parallel with and between the coal measures, but in very few instances is it of sufficient thickness to be worth the trouble of extraction; it produces on an average from 45 to 47 per cent. of metal when melted.

Of the coal seams there are eighty-three, all of which are workable at some part of the basin, but none of them throughout their

whole extent. These seams may be divided into three natural divisions:—The first or inferior series, containing thirty-one seams of coal resembling anthracite in the total absence of all bituminous matter. The second or middle series, containing twenty-two seams of slightly bituminous coal, capable of being made into coke for the melting of iron.

The Meuse divides the basin into two parts; and it may be noted that, passing from Huy to Liège, the mines on the right side of the river are of great extent: this arises from the great change which takes place in the size and quality of the seams on either side of the river; on the right side they diminish and become poor in a very short distance, whilst on the left side they develop themselves to their greatest extent. The basin is divided or traversed by five great Faults, which are respectively called the faults of Gilles and Pirotte, Gaillard Cheval, St. Giles, du Bouck, and de Reys. These Faults are principally filled with argillaceous and other matter, where a space occurs between the dislocated strata, but frequently there is no separation of the ground by an intervening space, the coal being suddenly thrown up or down without any previous indications of such derangement. Where the Faults are filled with sand or other porous materials, they are extremely troublesome to the miners, as they serve as conduits to throw the water from the surrounding strata, and down to the lowest parts of the mine. No trap-dykes are found in this basin.

The seams of coal are very subject to sudden diminutions in size and deteriorations in quality, arising from the effusion of clayey or stony matter into the body of the seam; this change is generally indicated by a soft argillaceous substance forming the roof and sill of the mine, or by large spherical modules of claystone, containing some carbonate of iron, and which are causes of great danger to the miners, for, being very large, their weight is alone sufficient to detatch them from the roof, when the coal is taken from under them. Towards the edges of the basin the seams are distorted in a singular manner, for it frequently happens within the space of one concession that the same seams shall crop out and re-enter it several times. What is most remarkable is, that the continuity of the seams underground is not broken, but the coals continue of nearly the same thickness throughout all the windings. The angle of ascent of the seams is 80° above the horizon, and that of descent 20° below it—the lower beds of coal frequently descend 500 yards from the surface before they change their direction to return.

Some of the mines in the neighbourhood of Liège are worked at great depths. That of Horlet, for instance, is 504 yards from the surface, and contains twenty-three seams of coal belonging to the first division, but which are here bituminous, as well also as at Seraing, immediately opposite it on the other side of the Meuse. The ventilation is generally good, with the exception of some of those towards the edge of the basin. The machinery on the large mines is good, and for the most part of the English pattern.

There are very few shafts lined with brick-work or timber to any extent, as the ground is sufficiently firm to stand without support; there is little variation in it throughout, being for the most part hard schist or shale interspersed with a few bands of gritstone.

Since the separation of Belgium from Holland, the value of coal properties has greatly increased, and the demand for coal is so great that any ground offering the most remote chance of producing it, is eagerly sought after by capitalists and speculators. The price of the coal varies from 18 to 35 francs per ton at the pit's mouth.

Basin of the Sambre. This basin extends six leagues in length, by one in breadth at the widest part. Here, as in the valley of the Meuse, the measures are highly inclined, and so much disturbed as to render it a matter of great difficulty to ascertain their continuity with any degree of exactitude.

There are 114 seams of coal in this basin, which may be divided into the inferior, middle, and superior series, as in the basin of the Meuse; indeed they are the same measures continued, the separation of the two basins (as before observed) having been caused by the upbearing of the strata beneath, which there forms an autoclinal axis, and dip in opposite directions; on the one hand towards Liège, and on the other towards Namur and Mons.

The coal measures are less disturbed towards the centre of the basin than at the edges, consequently they are better known there, and have been more extensively worked.

Within the great basin exists several smaller ones, whose general direction is from east to west. The seams have a dip of about 35° to the south, and from 75° to 90° to the north. At Mons they are much more regular, having but a slight dip of 6° towards the centre of the basin, and are gradually elevated until they outcrop at the surface. The Mons coal is considered the best in Belgium, but it is doubtful if it be of so old a formation as the Newcastle coal, for, on coking it in a close vessel and then fracturing it, large pieces of pure charcoal may be observed, having the fibres complete, and in every respect resembling ordinary charred wood. There is an immense demand for the coal of this district for domestic use in France, and for the supply of the iron and other works in the vicinity of Mons. The price is from 17 to 23 francs per ton for the best quality at the pit's mouth, and were the prohibitory duties now levied on English coal in the ports of France to be removed, the whole of the exports of that article into the west of France would cease, as they could not, with the disadvantage of land and canal charges, compete with sea-borne coals. Some small quantities of carbonate of iron are found in this basin, but they are of little value, being too small to work with profit. Nearly all the furnaces, both at Mons and Liege, are supplied with the rich Hydrate of Iron, found in the upper oolite, or Hastings sand formation, which skirts the coal fields, and forms the principal part of the soil in Luxembourg, and the neighbouring territory of France; indeed, so great is the demand and so high the price of Iron, that, for several years past, the furnaces of Mons and Valenciennes have been supplied with 10,000 tons of iron ore from the neighbourhood of Boulogne, a distance of 117 miles, more than 20 of which are overland, and the remainder by canal.

The remaining observations to be made on these interesting localities will form the subject of a future paper.

FRENCH ACADEMY OF SCIENCES.

Fine Arts:—New results connected with the arts, obtained by the action of one of the primary forces of nature, namely, electricity.

After the unexpected invasion, and somewhat remarkable progress, which light has just made in the domain of the fine arts, it is not very surprising that electricity, which, in point of subtlety, is well qualified for such an achievement, should likewise endeavour to distinguish itself in this brilliant career.

M. Jacobi, a learned foreigner, who has, if we mistake not, paid considerable attention to the most important problem which, at present, can engage the attention of inventive genius, namely, the means of applying the giant power of electro-magnetism, which plays

so important a part in the physical phenomena of our globe, as a prime mover applicable to manufacturing purposes, and of substituting the invisible action of the universal and constant forces of nature in place of the crude and expensive machinery of our own insignificant powers; M. Jacobi, we say, has conceived the possibility of finding in electric action an agent capable of producing, with perfect precision, either in relief or in intaglio, a fac-simile of any given design, and he says that he has succeeded in his endeavours. He thus produces copies of bas-reliefs, even of considerable size, by forming them in separate pieces, which are afterwards accurately joined together. He proposes to execute, upon this plan, copies of the celebrated compositions of the gates of the Baptistery, at Florence.

As we now have drawings which might be inscribed *fecit lux*, (a motto which, by the by, might run the risk of contradiction) so we are in a fair way of having statuary, of which it may be said, *fecit fulmen*. However, our artists need not be afraid of this new rival, descended from such a height to contend with them. The *impression* that he can make will never be very formidable; and the announcement of the discovery, drawn up by a noble Russian lady, which M. Demidoff presented to the Academy long after the public had been made acquainted with it, greatly exaggerates its real value.

Be it known, then, that this new process, which has no connection with photogeny, is merely a very doubtful application, to the purposes of art, of a principle which has been known since the time of the earliest discoveries relating to chemical decomposition by the voltaic pile, viz., the successive transport of atoms by the current from one pole to the other. We must also observe that it is, in the first place, indispensable to have a model, a mould in metal perfectly executed; for the result of the process is merely a copy slowly produced by a sort of electro-chemical casting process; a result curious, it must be admitted, but which might be obtained more quickly, and, in all probability, with equal accuracy by the ordinary modes of proceeding. The method is chiefly applicable to the production of metallic copies in relief of a copperplate previously engraved in intaglio, and of copies in intaglio of a design previously executed in relief, &c.

The following extract from the "Philosophical Magazine," gives a clear description of the process

It consists in immersing an engraved plate in a saturated solution of sulphate of copper, and making it play the part of a negative pole. The positive pole is also of copper, which oxidizes and dissolves, and thus supplies the place of that which is reduced by the current and precipitated on the engraved plate. A current of moderate force must be used, so that the action may not be too rapid. Fifty or sixty grains of copper should be precipitated on every square inch of surface in twenty-four hours.

Organic Chemistry:—Of the action of Chlorine on the compounds of Ether.

M. Regnault, engineer of mines, has just made a novel and striking application of the fertile principle of substitutions, which, in spite of the objections to which it has given rise, has, in the hands of the learned reporter, given decisive proof of its vast importance in chemistry. The principle consists, as is well known, in this, that an organic substance being given, it is possible to substitute for any quantity of the hydrogen which it contains, or even for the whole quantity of that element, a corresponding quantity of chlorine, equivalent for equivalent, and thus a new set of compounds may be obtained, whose composition and properties may almost always be foretold.

In operating in this manner on hydro-chloric ether, the author has discovered a series of six very curious new compounds, which contain respectively two, four, six, eight, ten, twelve atoms of chlorine. These compounds are precisely analagous in composition to those produced by the action of chlorine upon olefiant gas, but very different in their properties. As the quantity of chlorine increases, the density of the liquid, and that of its vapour, likewise, increase, and the boiling point rises from the first degrees of the scale to upwards of 200° (Cent.)

M. Regnault has obtained similar and very interesting results by operating upon common ether, wood-spirit, and methylic ether. This memoir, in which the author endeavours to prove that the secondary compounds obtained by substitution belong, chemically speaking, to the same mechanical system, will be printed in the collection, of the memoirs of foreign *savans*.

Hygiene.—Amongst the memoirs presented to the Academy, and which display an undeniable character of usefulness, accompanied with singular merit in execution, those of Dr. Londe claim a conspicuous place. The work of this physician upon hygiene, the result of long and conscientious researches from the best and most recent sources of information, and which has already been highly praised in several foreign languages, presents, in a clear and striking point of view, the *tout ensemble* of the numberless and hitherto scattered facts and principles of which this vast science is composed. Hygiene is not, according to this author, what it is usually defined to be,—"that part of medicine which has for its object the preservation of health," but the science whose object it is to direct the organs in the exercise of their functions, so as to guide and support the individual and the species, as well with regard to intellectual and moral as to physical condition, in the highest state of development of which their nature is capable in the actual state of things.

A word or two respecting the simple and comprehensive plan of the work, a plan which of itself would be sufficient to distinguish this work from most of those which have been written on the same subject. The author makes the study of the various bodies in nature which give rise to our enjoyments subordinate to the subject of hygiene; that is to say, to the study of the organs whose functions they excite, and of those organs considered successively in the strict order of their distribution and physiological connection. This arrangement is simple and natural, avoids a host of tedious repetitions, and brings, as we have seen, under one point of view, the whole subject and maxims of hygiene. We will add, that the execution of the plan is even superior to its conception.

Photography:—New simplifications of some parts of the process of M. Daguerre: of the application of the vapour of Iodine.

M. Séguier announced that he has discovered the cause of the utility of the little band of metal, whose action appeared to be a *sine qua non*, and which, together with the equally indispensable inclination of the plate, seemed to envelope the mystery of the photographic process in a mystery of another description. This border is found to be no longer necessary for the regular and homogeneous distribution of the vapour of iodine.

If a plate be covered on both sides with a sheet of pasteboard, previously impregnated with vapour of iodine, (by being placed over a bed of carded cotton at the bottom of the box, strongly charged with this substance), and between the pasteboard and the metal plate above there be interposed a small frame of hard wood, 1 or 2 centimetres high, previously varnished with gum-lac, (a substance which prevents the iodine from penetrating the wood), then, as the evaporation proceeds, the film of iodine diffuses itself over the silver

with perfect uniformity, and in a very short time, notwithstanding the absence of the metallic border.

This border appears to have been intended to prevent the excessive deposition of iodine, which otherwise would have been caused by the vapour proceeding at once from the sides of the box which contained the iodine, to the edges of the metallic plate. We may observe, that by the arrangement just described, the lower sheet of pasteboard becomes impregnated with iodine, and thus prepared for another operation.

Application of the Vapour of Mercury.

M. Séguier likewise communicated, in the name of M. Soleil, optician, a very convenient simplification of this other part of M. Daguerre's process. Instead of metallic mercury, which is not easily transferred from place to place, M. Soleil pours three or four drops of acid nitrate of mercury on a plate of copper. The application of heat to the plate causes the emission of a quantity of vapour of mercury, which produces the most satisfactory results.

We are bound to add that M. Arago has claimed for M. Daguerre priority, or, at all events, equality in point of time with M. Soleil, in this improvement, upon which, by the way, he made a few remarks at a former meeting, not however such as to give any precise notion of the nature of the improvement.

Appearance of Colour in Photogenic Drawings.

We have already noticed the attempts made both by M. Daguerre and another person, in France, and the celebrated Herschel, in England, to produce an imitation of the natural colours of bodies in pictures produced by the action of light. The English philosopher appears to have succeeded in obtaining on a certain substance the greater part of the prismatic colours, excepting the red, though very imperfectly, and without any relation to the natural colours of bodies. A photographic drawing has been sent to the Academy, from Toulouse, in which some appearance of colour is visible, and the red is the very colour which is produced. A roof covered with red tiles appears with its peculiar tint; but some window-shutters in its neighbourhood, painted green, appear in the drawing with the same red tint, although the trees and grass in the surrounding landscape present no such appearance. This red tint, which is here and there very decided, appears to be the result of chance. It is probably the exaggeration of these warm tints which we have at times observed on certain photographic drawings. The drawing in question is by M. Bianchi, optician, of Toulouse.

Physical Science:—Rays of heat.

It is known that the action of light on the film of iodine of silver on plates prepared for the production of photogenic pictures, is not perfectly uniform at the same hours of the morning and afternoon, when the sun is at the same height above the horizon. M. Melloni announces the observation of a similar fact in connection with the non-luminous calorific rays which are mixed with the solar light. Having several times repeated the analysis of these calorific rays, by means of a prism of rock-salt, the substance which transmits them with the greatest facility, he has ascertained that the quantity of heat transmitted, under circumstances precisely similar, as regards intensity of radiation and transparency of the air, is not always the same: the maximum of temperature is not always at the same part of the dark space which extends beyond the red rays of the solar spectrum, but is sometimes nearer to the extremity of the luminous part and sometimes farther from it. The author concludes from this that the non-luminous rays of heat arrive to us in greater or less quantity, according to certain peculiar modifications of the state of the atmosphere, which have no influence on the transmission of the luminous rays.

Physico-Mathematical Science:—On Harmonic Sounds.

It is well known that when a stretched cord is made to vibrate it produces, besides its fundamental note, certain very audible secondary sounds, the explanation of which has given rise to several theories, presenting but little accordance one with another.

M. Duhamel has renewed the investigation, both by analysis and experiment, and has arrived at this general conclusion:—that when a body produces several sounds at once, its surface divides itself into distinct parts, in each of which all the points make the same number of vibrations, corresponding respectively to the different sounds produced. This conclusion is in strict accordance with the results of experiment.

Steam Engines:—Influence of the fire-place and the tubes of the boilers of locomotive engines on the generation of steam.

A knowledge of the vaporizing power, per hour, of the different parts of the surface of boilers is too important a matter not to have long been the object of inquiry. The rule commonly admitted on this point, but which is based upon experiments made on the small scale, and without using the blower, is that, for the same extent of surface, the fire-place has a vaporizing power three times as great as that of the tubes.

M. Pambour has lately submitted this law to the test of experiment, with engines of various sizes, such as are used on railroads, and presenting considerable differences in the whole surface heated, and that of the fire-place. Now, M. Pambour has actually found that, in the locomotive engines commonly in use at the present day, having their tubes of medium size, such that the flame can traverse them throughout their whole length, the tubes produce from the same extent of surface as much vapour as the fire-place, and that, consequently, it is not safe to be guided by the rule commonly received as correct.

Geology:—Graphic illustrations, affording a comprehensive view of this science.

Amongst the useful works presented to the Academy in connection with part of natural history, we have noticed the designs recently published by M. Boubée, showing both the mineralogical structure of the globe, and the characters which it has presented at different periods. These designs relate to some of the highest questions in natural philosophy, and present, with clearness, a vast compendium of geological science.

Dyeing:—Polychromatic acid producing a variety of beautiful and permanent colours.

M. Boutin calls attention to a peculiar acid produced by the action of nitric acid upon aloes. This acid has already been obtained by other chemists, but, according to the author, always in a state of impurity, although it may be purified by simple washing. This acid, which is in the form of a red-brown powder, very bitter, very astringent, but little soluble in water, to which, however, it communicates a beautiful purple tint, has the remarkable property of forming, with metallic oxides, a large number of salts, presenting a great variety of colours. Some of these are soluble and crystallize with facility, but most of them are insoluble, some of them detonate when heated. These salts, which present so great a variety of colours, appear to the author to deserve a place amongst our dyeing wares. He has applied them to various substances, such as silk and wool, and, by varying the mordants, he has succeeded in dyeing these articles with a variety of very delicate, and, at the same time, permanent colours. He has produced a variety of browns, Corinthian red, violet, blue, yellow, green, &c. This substance seems to merit the attention of chemists, and of those interested in the art of dyeing.

M. Boutin announces, at the same time, that he has also obtained, by the action of nitric acid upon aloes, an acid which he believes to be isomeric with the hydro-cyanic, and which appears to possess in an equal, if not in a superior degree, the dreadfully poisonous action of the latter.

The Academy of Sciences proceeded yesterday to the election of a vice-president, M. Poisson, the vice-president of the preceding year, taking, without election, the office of president for the current year. At the first scrutiny M. le Docteur Serres obtained twenty-three votes out of fifty-two; M. Thenard, twenty-two; at the second, M. Serres, 26; M. Thenard, 25; finally, on the examination of the votes, M. Serres was elected by a majority of twenty-eight to twenty-three. M. Flourens announced that the public meeting for 1840 would take place in April.

NAVIGATION OF THE MEDINA.

Every one who knows the Isle of Wight,—and all Britons who do not know it, have something of their native country to see, admire, and enjoy;—every one who knows this most interesting of all the small British isles, must be aware that the borough of Newport, the appropriate capital, is not only the finest town in the island but one of the finest little towns in the kingdom, and the one in which a visitor, who wishes to see and enjoy the whole of the island, can most advantageously take up his residence.

The more spirited inhabitants are aware of this, and various proposals have been made for converting it into a port. Deepening the upper part of the Medina—the lower is deep enough—is the plan which has generally been proposed; and this, among other reasons, because the two costly tide-mills of East and West Medina, would require to be purchased if any other plan was adopted. But the removal of the mills to Cowes, a distance of two miles and a half, would be an advantage to them, because they could work for a longer time every tide. In that case a weir and lock at East Cowes, not a very expensive work, would throw the whole channel into a perfectly safe wet dock of more than 640 acres in extent. There are few local improvements that would be more valuable than this if fairly carried into effect. The mere deepening of the channel would be a very inferior matter.

THE MAIDENHEAD BRIDGE ON THE GREAT WESTERN RAILWAY.

We copy the following remarks, slightly abridged, from the Railway Times, the Editor of which personally examined the structure, during the past month. We are truly sorry at the sad account of this great engineering work, which, satisfactorily completed, would have eclipsed every thing of the kind previously attempted, and have alone placed Mr. Brunel, as is his father, among the very first of modern engineers, for boldness and originality. We shall give our readers some information respecting this work in our next number.

"The Maidenhead Bridge consists of ten brick arches—two principal or central arches of (it is said) 120 feet span each, and eight smaller arches of from 15 to 25 feet each, four of which at the eastern end are what are familiarly called land arches, while the river flows through the four arches at the western end, in the same way as through the two principal or central arches.

"We commenced our examination with the first arch at the east end of the bridge, and, numbering onwards, the following are the facts which we noted respecting each.

"No. 1. *Cracked in two or three places*; signs of workmen having been recently employed in repairing, that is, in filling up externally the cracks caused by the inadequacy of the arch to sustain the pressure to which it is subjected.

"No. 2. To all appearance sound.

"No. 3. *Very much cracked;* so much so in several places *that you may thrust your hand in!*

"No. 4. (The arch over the towing path). Sound.

"No. 5. The first of the two principal or central arches, which, completed towards the end of 1837, was condemned early in 1838, and in the course of that year taken down as far as the haunches, and rebuilt. We have great doubts, although the centering has been eased, whether the arch is not resting on it. On the south side there appears to be a free space of about an inch, but on the north side the battens which overlay the centering have every appearance of being forced hard up against the soffit of the arch. To the eye, especially at a distance of two or three hundred yards, the curvature of this arch appears to have undergone but small variation; but, when closely examined, the signs of an inward and serious disturbance of equilibrium having taken place are abundantly manifest. About half way up from the springing of the arch, at the west end on the north side, there is a fracture which extends in an angular direction from the coping of the centre pier all the way through the spandril, the haunch, and the rings, arising evidently from an undue downward pressure in that direction; the courses of bricks have been crushed rather than rent, and behind the face of the last ring there is one course of bricks (running transversely) which has been thrust at least an inch out of its place.

"No. 6. The second principal or central arch presents more the appearance of the peaked Gothic ellipse than of the flat ellipse still preserved by the neighbouring arch; on the south side it seems to rest heavily on the balks which overlay the centering, but on the north side it has the appearance of standing clear of the timbers all round.

"Nos. 7 and 8. Apparently sound.

"No. 9. *Cracked* in several places.

"No. 10. The last arch at the western end, *the most cracked of the whole;* one ugly rent in the centre (lengthwise) extends from the crown down to the water's edge."

ADAMS' PATENT RAILWAY CARRIAGE.

On the 30th ult. a vertebrated carriage, constructed according to the patent plan of Mr. Adams, with bowspring, bearers, and buffers, for the Birmingham and Gloucester Railway Company, left the station at Euston-square, with one of the trains for Birmingham. Much speculation had existed as to its action on the rails, owing to the various peculiarities of its construction, and especially from the circumstance that all four wheels were loose on the axles, in addition to the axles running as usual in the ordinary bearings, It has been hitherto found that carriages with loose wheels are apt to run off the rails, at slight curves, but such proved not to be the case with the vertebrated carriage, which adapted itself to all curves with the greatest facility. In fact it seemed almost impossible for the wheels to run off the rails as the axles always disposed themselves at right angles to the line of traction, and the lateral yielding of the springs prevented any friction against the flanges of the wheels. Another objection which had been raised against the carriage by persons connected with railways was, that though it might be drawn forwards in a train, it could not be propelled, as the joint would yield, and the wheels go off the rails by an angular thrust. This opinion also proved fallacious, as the carriage was found to go equally well either way.

The facility of draught was found far greater than that of carriages on the ordinary plan, though much larger than common, consisting of four bodies instead of three. The facility of its movement was strikingly illustrated at the Euston station, where two of the wheels got off the turn-table and escaped from the rails. The usual course in such cases is to raise a common carriage by means of screw-jacks, but owing to the action of the joint, and the free movement of the wheels, the vertebrated carriage was rolled upwards by the labourers with little apparent difficulty, without resorting to mechanical aid. We understand that it is intended to run the carriage between London and Birmingham previous to the opening of the Gloucester Railway, and judging from its satisfactory performance in remedying various railway evils, there seems to be little doubt that this plan of carriage will come into general use. We understand that another improvement by Mr. Adams will shortly be brought forward, consisting of a more perfect lubrication of the axles by means of oil instead of grease, and without the usual waste, so that a carriage will probably run a week with only once oiling. We apprehend that the saving of friction on the wheels, owing to the free revolution independent of each other, will materially increase their durability.—*Railway Times.*

NEW SOLDERING APPARATUS.

An apparatus for soldering, on a principal entirely new, has been recently introduced into this country. The exhibition of it at the Institution of Civil Engineers, on the 21st January, excited much attention among the members. The following brief description of it may not be uninteresting. The apparatus consists of a chamber containing hydrogen gas, which, issuing therefrom, passes through a long elastic tube, and terminates in a curved pipe; but, before it escapes, a small portion of air is mixed with the gas, through another elastic tube connected with a small pair of bellows, worked by the hand or foot of the workman. To solder anything it is sufficient to direct the flame on the object, the metal melting will solder the fracture. This mode of soldering is applicable to all situations and places; to any angles, either projecting or receding, or even conveniently overhead; of course the jet can be made to issue in any direction from the pipe; its action is insignificant unless acted upon by the bellows. We are not acquainted with the gentleman who introduced this apparatus to the institution, but the inventor of it is Baron Desbassins, of Richemond. It was shown at the exhibition at Paris last spring, and was then justly considered of great importance. It will, doubtless,be found eminently useful in connecting tubeing for locomotive boilers, and in various ways connected with mechanical engineering.

THE RECENT LAND-SLIP IN DORSETSHIRE.

One of the greatest convulsions of nature on record, or that has taken place in the memory of man in this neighbourhood, has occurred in Dowlands and Bending cliffs, situated between Lyme and Axmouth harbour. Various are the opinions respecting it—some attributing it to the long continued and heavy rains, others insisting on its being an earthquake. If we may judge from its effects, it certainly has every feature of the latter. We are no strangers to the occasional gliding of cliffs on this part of the coast, both east and west; but here is presented a scene of awful grandeur. The above cliffs, which are very lofty, are about three miles west of Lyme Regis. This remarkable event took place on Christmas-eve and the two following days. A space of land along the cliffs, consisting of about sixty or seventy acres (it may be more) has parted from the main land, and advanced or slid towards the sea, leaving a dreadful chasm between the main land and itself, of great depth and breadth. The sea-shore, which lately was low and shelving, is now risen up in a mighty ridge or breakwater, of more than a mile in length, and of considerable height. The length of the cliffs affected by this shock is more than two miles, and perhaps in breadth about one, encompassing nearly a thousand acres. Immense and ponderous rocks in front of this scene of action have been forced by the concussion from their beds, where they have reposed for ages under the bed of ocean beyond low water mark, and made their appearance in pyramids and different forms, in some places forty or fifty feet above the sand, and have wonderfully formed a sort of harbour, whilst the beach adjoining the land remains unmoved. Boats have entered this naturally formed harbour, on the eastern side, which is shallow, and found in the middle three fathoms of water. The sea outside the ridge is several fathoms deep, and has a sandy bottom, which before was rocky. In the chasm are to be seen fragments similar to the ruins of a vast building—pinnacles and pillars, round, square, and angular, some of whose summits are crowned with the turf and grass of the ruined land—also trees, which lately adorned the sides of the cliffs, lying with their roots upwards; and the numerous cracks visible in the bottom of the chasm cannot fail to impress the spectator with an awful thought of the mighty convulsions which nature endured to produce such a wonderful alteration. The chasm is somewhat of a circular form—that is from one extremity to the other—the edges are very rugged. A singular lofty rock, known by the name of "the Priest," is laid prostrate. Another lofty rock, standing on the sea-shore, called "the Pinnacle rock," an erect pillar, and which used to be visible from the road leading to Beer, is now hidden by the great ridge, and appears like a leaning tower, near the edge of the before-mentioned pool. The Breakwater at Plymouth sinks into nothing when compared with the vast ridge which a freak of nature has produced here in the space of a few hours. We are happy to say that Providence so ordered it that no human life was lost, and not a hoof perished. The cliff above the harbour, where the look-out house stands, and where the flag-staff stood, is cracked. The door, windows, and roofing have been removed by the coast-guard, and it is expected to fall; the ground has sunk several feet. Dr. Buckland, the Oxford geologist, who has been residing in Lyme for some time past, has prolonged his stay, in order to explore and view the wonders of this phenomenon of nature. He states that he never witnessed any thing equal to it in England. It is to be hoped that his, or some other able pen, will gratify the public by a full and proper description of the scene.

[Note by the Conductor.—The extreme humidity of the season has occasioned land-slips in other places where the strata consists of thick beds of clay or marle alternating with stone. One has taken place near Ventnor, in the back of the Isle of Wight, and another at Headon hill, to the northward of Alum Bay, and if a third has not taken place, and greatly altered the character of Black-gang Chine, it is impending. We shall take an early opportunity of saying something on the cause and phenomena of these land-slips.]

Mount's Bay Breakwater.—The spirited inhabitants of the county are continuing their exertions for the execution of this great work, one of the utmost value upon that stormy coast.

RAILWAY INTELLIGENCE.

A MEETING of merchants was recently held at Trieste, at which the Archduke John presided; the object was the construction of a railroad from Trieste to Vienna. According to the plan of the engineer, Sommering, the only interruption to the line is a few miles of very mountainous country, which will be travelled by horses. At the castle of Duino, about three leagues from Trieste, the railroad will join the great Lombardy and Venetian branch. The archduke expressed his admiration in the warmest terms; and added that it was the earnest wish of the emperor that this great desideratum should be effected, by which we may bid adieu to the shores of the Adriatic in the morning, and sleep in the Austrian imperial capital the same night.

DUNDEE AND ARBROATH RAILWAY.—This great public undertaking is nearly completed, the embankment has been formed up to the Gas Work, and in the course of two or three weeks the embankments from the east and west will have nearly met. As an arrangement has now, we believe, been made with the Harbour Trustees, the public will soon have the full benefit of this conveyance from Trades-lane to Arbroath, and the inconvenience and trouble occasioned by the omnibuses will be avoided. It is said there will be a grand opening on the completion of the line; and it is not unlikely that Lord Panmure, who has all along manifested the greatest interest in the work, will be present. There are four vessels in a dangerous situation, as they will be closed in unless they get launched at the next spring tide; the parties will have themselves to blame if such an event takes place, the vessels being all ready for launching.—*Dundee Courier.*

GREAT WESTERN RAILWAY.—THE BOX TUNNEL.—Considerable more than half of the excavation of this stupendous work has been executed, and as new shafts have been sunk by the contractor to regain the arrears at certain points, no doubt is entertained that the tunnel may be completed within the present year. At the London end of the line every exertion has been made that the weather would allow to complete the heavy cutting at Sonning Hill, near Reading. The earthwork is now just finished, and the ballast is being spread upon the line, after which the laying of the timber and rails will proceed rapidly. Good progress is made with the station at Reading, and it is expected that the railway will be opened to that town before April next.—*Bristol Mercury.*

GREAT-WESTERN RAILWAY.—The continued slipping of the earth embankment on the line of the Great Western Railway, near the Victoria Public-house, at Patterdown, on the Lacock-road, is assuming a serious aspect, and threatens the safety of that building. At a previous and not very distant period, the slip of soil covered some acres of land, and it is likely that at present an equally extensive injury will take place. It is supposed to proceed from the pressure upon the under layer of marl and clay, which, pulverising by the action of the atmosphere into an almost impalpable dust, is unable to offer any resistance to the continual force of the upper body of earth, stone, &c. &c., which form the tram surface of the line. Every attempt as yet made to check the danger by erecting walls has proved unavailing, as its force is sufficiently great to remove these as well as minor obstacles.—*Wilts Independent.*

LONDON AND BIRMINGHAM RAILWAY.—Saturday evening a considerable subsidence took place at the Blisworth embankment, half way between the station and the bridge over the canal. The earth having become thoroughly saturated by the late rains, gave way at the bottom, and the surface in consequence gradually sunk, at one point several feet. Since then it has continued to subside at the rate of a foot an hour, and on one occasion between two and six in the morning, when the men ceased to work, it sunk eight feet. A large force of men were collected the moment the slip was discovered, and employed day and night replacing the soil that had given way with ballast, the trains in the mean time passing slowly over the spot. The gap is always filled up by the arrival of a train, and the precautions taken are such as to do away with all idea of danger. The ballast is brought partly from Bugbrook, but chiefly from Hilmorton, about sixteen miles distant.—*Northampton Mercury*, Jan. 11.

LONDON AND SOUTH-WESTERN RAILWAY.—The whole of the rails are being now laid down between the temporary terminus at Northam and the terminus on the Marsh, the engine has several times been along the whole line. The building on the Marsh is also completed, and rising, as it does, higher than any of the adjacent edifices, forms a very conspicuous object, especially when viewed from the water. Workmen are actively engaged on the yet unfinished part of the line between Winchester and Basingstoke, and though the late unseasonable weather has impeded their progress in a great degree, little doubt is entertained of their completing it by the 1st of May, when the good folks of Southampton will be enabled to reach the metropolis in three hours.—*Southampton Paper.*

MARYPORT AND CARLISLE RAILWAY.—At a meeting of the Directors of this railway, held on Saturday last, there was a report upon the state of the works, &c., by John Blackmore, Esq., lately appointed engineer to the company. It appears that about seven miles of the railway will be ready for the carriage of coal and lime about the first week in April next. Arrangements were entered into with parties desirous of taking coal along the line for shipment at Maryport, from which it is evident that an income will at once be realized sufficient to pay ten per cent. upon the amount of capital that will then have been expended, and this without taking into account any other source of traffic or the increase of coal that will undoubtedly take place. The engineer has commenced the necessary surveys for setting out the work on the remaining twenty miles, from Carlisle to Aspatria, and for enabling the agreements to be made for the land required.—*Carlisle Patriot.*

SHEFFIELD AND MANCHESTER RAILWAY.—MR. VIGNOLES has resigned his office as Engineer-in-Chief to this Company, and Mr. Locke has been appointed to succeed him. The Directors, we understand, intend pushing forward with all possible vigour, the works between Glossop and the Manchester terminus, so as to be able to open in the first instance through that very populous and productive district. The works at the summit tunnel are making very satisfactory progress.—*Railway Times.*

Railways in the Midland Counties.—It has been lately announced that a bill will be applied for in this session of parliament, if possible, for a power of constructing a branch railway between Coventry and Leamington, which is expected not only to be of considerable advantage to the last-mentioned town, as a watering-place, but also to the tract of country across which it passes. It is also stated that the directors of the Manchester and Birmingham line will make every exertion to extend, within two years, a line to the Grand Junction, at Crewe, and, in all probability, ultimately extend to the Potteries.

SAVOY.—The railroad from Chambery to Bourget was opened the early part of October, in the presence of the King of Sardinia: it is two French leagues in length, and runs by the side of a canal, and within an avenue of poplar trees, affording a most picturesque view of mountainous country and the shores of the sea near Bourget. It

will effect a great improvement in the trade between France and Chambery, as it is connected with the steam-boats which run between Lyons and Bourget.

Railway Commissioners.—Sir F. Smith, Royal Engineers, Colonel Cunningham, Royal Engineers, and Professor Barlow, the commissioners to whom the government has referred the competing projects for the best and most direct railway communication between London and Dublin, have completed their inspection of the proposed routes and terminal harbours on the Welsh coast, and are now in the north making similar inquiries relative to the projected lines to Scotland. They have inspected the whole of the line from Holyhead to Chester, recommended by Mr. George Stephenson. The latter gentleman has had an interview with the commissioners. They have also been visited by one of the leading promoters of the Porthdynllaen and Shrewsbury line.

MISCELLANEOUS FACTS AND REMARKS.

Windsor Castle.—An accident, though as hitherto not a very serious one, which has occurred in this splendid national structure, shows how dangerous it is to tamper within the vicinity of the foundations of a ponderous building. This was a fracture of the wall at the north-western extremity, close to Winchester tower, constructed by, and once we believe the residence of, the illustrious William Wykeham, and now the abode of Sir Jeffery Wyatville. This fracture has extended to a length of twenty-five yards, and, as far as it has been explored, it extends down to the very foundations, and continues widening. The latter circumstance shows that the mischief done must be in the foundation not in the building, and that it may be much greater than it is at present. It seems that the cause of this, at least in so far as known, is the digging of a deep trench close to the new terrace wall, by order of the dean and canons of Windsor, who are proprietors of the ground here. The intention was to carry off the water which ran from the terrace, upon the slope; but, from some cause or other, it did not answer this purpose. The ditch became a stagnant sink, the water of which soaked in toward the foundations, at the same time that the continuity of the abutment formed by the slope was broken; and, consequently, the wall of the new terrace, which is comparatively a green wall, was left without the requisite support. Thus, the operation was much the same as if one were to take out the backing of an abutment of a bridge, and fill its place with stagnant water, and the consequence has been similar. This is a remarkable instance, not only of the danger of allowing unskilful persons to tamper with what they do not understand; but, also, of that of allowing any party but the public to hold property, and carry on operations upon it, near to a building of such national honour and importance—to say nothing of expense—as this most splendid of British palaces.

Southern Boundary of New Brunswick.—A statement lately made by Mr. Featherstonehaugh, one of the commissioners for adjusting, if possible, this long-disputed line of frontier, shows that imperfect data may be given by national arbiters as well as by others. It seems that the point from which the two principal lines of boundary are to be determined is the north-west angle of Nova Scotia, an angle which has no name or existence in any treaty, and can be determined only by the meeting of the lines themselves, for the obtaining of which it is the principal datum.

Parisian Improvements.—The municipal budget of the expenditure of Paris, for 1840, contains the following items:—Enlargement of the Hotel de Ville, 800,000f.; hospitals, 365,000f.; consolidation of the stone quarries under Paris, 110,000f.; additional pavements by enlargements of streets, &c., 110,000f.; paving the inner Boulevards of the south, 100,000f.; footpaths in bitumen, granite, curbs, &c., of the Boulevards of the north, 100,000f.; premiums for the construction of foot pavements, 150,000f.; additional sewers, 152,000f.; distribution of water and reservoirs, 400,000f.; cleansing and improving the outer Boulevards, which are now in a state of filth, alike injurious to health and disgraceful to the capital, 115,000f.; enlargement of the streets, 1,532,020f. It should be observed, in explanation of the item of premiums for new foot-pavements, that, in order to induce the owners of houses to make such pavements, the municipality offer to pay a considerable portion of the expense. Notwithstanding this inducement, great reluctance is frequently shown by the owners to adopt the improvement. It is said that, in the Champs Elysées, although the prefect has offered to pay for 18 metres out of every 22, none of the owners of the houses have shown a willingness to pay the small portion of expense required from them.

Snow on the Heights of the Alps.—A letter from the canton of Uri states that the road of the Mount St. Gothard is so impeded by snow, which in different places lies from 100 to 300 yards deep, that it is impassable almost for foot passengers, as the frost has not been sufficiently severe to harden the snow, and avalanches are constantly falling. The great depth of snow in the passage of St. Gothard, and the heavy falls to which all elevated passes are subject, tend to point out very forcibly the advantages of underground transits through mountains, the same as that to which we have alluded as having been projected through the Splugen, between the valley of the Lake of Como and that of the Upper Rhine; and they also prove the judicious attention which M. Volta has paid to the rational improvements of cultivation in the Alpine districts. We refer the reader to the short paper on this project in another part of our present number.

LIST OF PATENTS GRANTED DURING JANUARY.

To John Leo Nicolas, of the parish of Clifton, Bristol, gentleman, for certain improvements in the method of constructing and propelling carriages on railways or common roads, and through fields, for agricultural purposes.—Sealed 1st January—six months for enrolment.

Samuel Lawson, of Leeds, and John Lawson, of the same place, engineers, and co-partners, for improvements in machinery for spinning, doubling, and twisting flax, wool, silk, cotton, and other fibrous substances, being a communication.—Sealed 2nd January—six months for enrolment.

Charles Greenway, of Douglas, in the Isle of Man, Esq., for certain improvements for reducing friction in wheels of carriages, which improvements are also applicable to bearings and journals of machinery.—Sealed 3rd January—six months for enrolment.

John François Victor Fabien, of King William Street, in the city of London, gentleman, for improvements in pumps.—Sealed 7th January—six months for enrolment.

David Low, of Adams-court, Old Broad Street, merchant, for improvements in machinery for crushing, preparing, and combing flax, hemp, phornium-tenax, and other fibrous substances, being a communication.—Sealed 7th January—six months for enrolment.

Moses Poole, of Lincoln's-inn, gentleman, for improvements in obtaining power, being a communication.—Sealed 7th January—six months for enrolment.

John Ridgway, of Cauldon-place, Stafford, china-manufacturer, for an improvement in the moulds used in the manufacture of earthenware, porcelain, and other similar substances, whereby such moulds are rendered more durable.—Sealed 11th January—six months for enrolment.

John Ridgway, of Cauldon-place, Stafford, china-manufacturer, and George Wall, the younger, of the same place, gentleman, for certain improvements in the manufacture of china and earthenware, and in the apparatus or machinery applicable thereto.—Sealed 11th January—six months for enrolment.

John Ridgway, of Cauldon-place, Stafford, china manufacturer, and George Wall, the younger, of the same place, gentleman, for certain improvements in the mode of preparing bats of earthenware and porcelain clays, and of forming or shaping them into articles of earthenware and porcelain, and in the machinery or apparatus applicable thereto.—Sealed 11th January—six months for enrolment.

Robert Montgomery, of Johnstone, in the county of Renfrew, gentleman, for an improvement or improvements in spinning machinery applicable to mules, jennies, slubbers, and other similar mechanism.—Sealed 11th January—six months for enrolment.

Christopher Edward Dampier, of Ware, attorney at law, for an improved weighing machine.—Sealed 14th January—four months for enrolment.

Hezekiah Marshall, of the city of Canterbury, architect, for improvements in window sashes and frames, and in the fastening of window sashes.—Sealed 14th January—six months for enrolment.

Arthur Eldred Walker, of Melton Street, Euston-square, engineer, for improvements in engraving by machinery.—Sealed 18th January—six months for enrolment.

Charles Wheatstone, of Conduit-street, Hanover-square, Esq., and William Fothergill Cooke, of Sussex Cottage, Slough, Esq., for improvements in giving signals and sounding alarums at distant places by means of electric currents.—Sealed 21st January—six months for enrolment.

Samuel Brown, of Finsbury pavement, civil engineer, for improvements in making casks and other vessels of or from iron and other metals —Sealed 21st January—six months for enrolment.

Joseph Rock Cooker, of Birmingham, gun-maker, for improvements in fire-arms, and in the balls to be used therewith.—Sealed 21st January—six months for enrolment.

William Stone, of Winsley, gentleman, for improvements in the manufacture of wine.—Sealed 21st January—six months for enrolment.

James Hall, of Glasgow, upholsterer, for improvements in beds, mattresses, and apparatus applicable to bedsteads, couches, and chairs.—Sealed 21st January—six months for enrolment.

Arthur Howe Holdsworth, of Brookhill, Devon, Esq., for improvements in preserving wood from decay.—Sealed 21st January—six months for enrolment.

William Coltman, of Leicester, frame-smith, and Joseph Wale, of the same place, frame-smith, for improvements in machinery employed in making frame-work, knitting, or stocking fabrics.—Sealed 21st January—six months for enrolment.

Samuel Wilkes, of Darleston, iron-founder, for improvements in the manufacture of hinges.—Sealed 21st January—six months for enrolment.

George Wilson, of St. Martin's-court, St. Martin's-lane, for an improved paper-cutting machine.—Sealed 21st January—six months for enrolment.

Charles Rowley, of Birmingham, stamper and piercer, and Benjamin Wakefield, of Bordesley, machinist, for improved methods of cutting out, stamping, or forming and piercing buttons, shells, and backs for buttons, washers, or other articles, from metal plate, with improved machinery, and tools for those purposes.—Sealed 21st January—six months for enrolment.

Edward Halliley, of Leeds, cloth manufacturer, for improvements in machinery for raising pile on woollen and other fabrics.—Sealed 21st of January—Six months for enrolment.

William Hunt, of the Portugal Hotel, Fleet-street, London, manufacturing chemist, for improvements in the manufacture of potash and soda and their carbonates.—Sealed 21st January,—Six months for inrolment.

Miles Berry, of the Office for Patents, 66, Chancery-lane, patent agent, for certain improvements in the manufacture of prussiate of potash, and prussiate of soda, being a communication.—Sealed 21st January—Six months for enrolment.

Jules Alphonse Simon de Gournay, of Bread-street, London, gentleman, for improvements in the manufacture of horse-shoes, being a communication.—Sealed 22nd January—Six months for enrolment.

George Clarke, of Manchester, manufacturer, for certain improvements in the construction of looms for weaving.—Sealed 23rd January—Six months for enrolment.

Alexander Hett, of Gower-street, Bedford-square, surgeon, for certain improvements in the arrangement and construction of fire-grates or fire-places, applicable to various purposes,—Sealed 23rd January—six months for enrolment.

James Bingham, of Sheffield, manufacturer, and John Amory Boden, of the same place, manufacturer, for certain improved compositions, which are made to resemble ivory, bone, horn, mother-of-pearl, and other substances, applicable to the manufacture of handles of knives, forks, and razors, piano-forte keys, snuff boxes, and various other articles.—Sealed 25th January—six months for enrolment.

Thomas Aitken, of Chadderton, Lancaster, manufacturer, for certain improvements in the machinery or apparatus for drawing cotton and other fibrous substances.—Sealed 28th January—six months for enrolment.

James Smith, jun., and Francis Smith, of Spital-works, near Chesterfield, lace-manufacturers, for certain improvements in machinery for the manufacture of figured bobbin, net, or lace.—Sealed 28th January—six months for enrolment.

William Pontifex, of Shoe-lane, London, Coppersmith, for an improvement in treating fluids containing colouring matter to obtain the colouring matter therefrom.—Sealed 28th January—six months for enrolment.

Henry Curzon, of the borough of Kidderminster, machinist, for certain improvements in steam engines.—Sealed 28th January—six months for enrolment.

John Whitehouse, of West Bromwich, Stafford, ironmaster, for improvements in preparing and rolling iron and other metals or metallic alloys, for the manufacture of certain articles of commerce.—Sealed 28th January—six months for enrolment.

William Mattershaw Forman, of Sheepshead, Leicester, frame-smith, for certain improvements in stocking frames and machinery used in frame-work knitting.—Sealed 28th January—six months for enrolment.

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